Midwest Engineer

SERVING THE ENGINEERING PROFESSION

WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

WHERE SHALL WE DRAW THE LINE—PAGE THREE

WSE MEETINGS—PAGE TWO

Vol. 6 OCTOBER, 1950 No. 5

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Western Society of Engineers

84 E. Randolph Street
Chicago 1, Illinois

MIDWEST ENGINEER
Published Monthly
BY
THE WESTERN
SOCIETY OF ENGINEERS
AT
2207 DODGE AVENUE
EVANSTON, ILLINOIS

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GENERAL AND EDITORIAL OFFICES
HEADQUARTERS OF
WESTERN SOCIETY OF ENGINEERS
84 E. RANDOLPH STREET
CHICAGO 1, ILLINOIS
TELEPHONE: RANDOLPH 6-1736

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Single Copy.....$ .50
Annual subscription.....4.00
Foreign subscription.....6.00

Entered as second-class matter September 23, 1948 at the post office at Evanston, Illinois under the Act of March 3, 1879.

Midwest Engineer

A Publication of the

WESTERN SOCIETY OF ENGINEERS

Serving the Engineering Profession

OCTOBER, 1953 — Vol. 6, No. 5

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COVER STORY

The picture on this issue's cover shows a spectacular close-up of the steel network which is to carry the elevated portion of the new Congress Street Superhighway. The view looks east towards Chicago's main Post Office. At the extreme right of the picture the arcade in the Post Office through which the highway will pass is visible.

October 12, General Meeting

Speaker: C. E. Bauman, chief electrical engineer, Harza Engineer Company.

Subject: "An Engineer's Observations Around the World." Mr. Bauman at this meeting will give his viewpoint of the world, the product of his extensive world travels. This interesting speaker is bound to raise some thought-provoking questions, and give some down-to-earth answers which only an engineer's objectiveness can give.

October 23, Prevue Ball

Entertainment: Paul Meeker (in person) and his nationally famous Drake Hotel orchestra.

Subject: Prevue of the Society's New Dining Room and other construction work completed or in progress.

You will enjoy a pleasant and satisfying social hour at 6 p.m. in the Headquarters lounge, at bargain prices. At 7 p.m. you will be served the delicious Prevue Dinner in the dining room. There you will be seated around the dance floor listening to the scintillating strains of the orchestra, and watching the other entertainment provided by the specialists in Paul Meeker's aggregation.

Reservations are limited, so call Headquarters at RAndolph 6-1736 right away.

October 27, Young Engineers Forum

This is the first meeting of the Fourth Young Engineers Forum. The theme will be "Engineering in Industry." H. P. Sedwick, past president of WSE, and president of Public Service Company, during his administration as president of the Society and original chairman of the Forum, with his committee laid down the objective that this group of meetings would give young engineers the chance to increase their engineering knowledge of the major lines of business in the community.

All of the sessions are dinner meetings, and the food is included in the $25 registration fee.

The program includes the following dates, subjects and speakers:

Oct. 27, "Utilities," J. D. Stockton, vice president, Illinois Bell Telephone Company.

Nov. 11, "Aviation," J. A. Herlihy, vice president, United Air Lines.

Nov. 24, "Steel," H. W. Johnson, vice president, Inland Steel Company.

Dec. 1, "Manufacturing," W. A. Roberts, president, Allis-Chalmers Manufacturing Company.

Dec. 9, "Municipal Engineering," V. E. Gunlock, commissioner of public works, City of Chicago.

Dec. 16, "Plastics," R. N. Boundy, vice president, Dow Chemical Company.

All of the speakers are leaders in their industry. They will make their talks short, and will devote the major part of the meeting to a discussion of the evening's subject. Emphasis will be placed on the young engineer's meeting and growing acquainted with the speakers and other industry leaders during the social hour before dinner.

Dr. Gustav Egloff, Society past president, and William R. Marston, a member of the Society's Board of Direction, are co-chairmen of this activity.

Enrollment is limited to 100, so you should register at once.

October 30, Traffic Engineering and City Planning Section

Speaker: There will be five speakers, each considering a different phase of the general subject of City Traffic. W. J. McCarter, general manager of the Chicago Transit Authority will be one of the speakers, as will Harry W. Lochner of the Harry W. Lochner Company and Lawrence Sheridan of Indianapolis, Ind.

Subject: "Metropolitan Traffic: Problems and Remedies." This will be a joint meeting of the Traffic Engineering and City Planning sections with the American Institute of Planners. The Institute of Traffic Engineers is being especially invited to attend.

On Saturday morning, October 31, the day following the Western Society meeting, the Chicago Chapter of the American Institute of Planning will sponsor a meeting in which the Traffic Engineering & City Planning section of WSE will take part. The subject of the Saturday morning meeting will be "Traffic Problems."

November 19, Gas Fuels and Combustion Section

Speaker: John P. Clennon, senior engineer, The Peoples Gas Light and Coke Company, Chicago.

Subject: "Gas Distribution Network Analyzer." The subject of computers and analyzers has received considerable attention during the past few years. At this meeting Mr. Clennon will discuss the Network Analyzer or Analog Computer which is installed at the Peoples Gas Light and Coke Company. He will explain how the Analyzer is used in the task of supplying gas to the city of Chicago.

Mr. Clennon will use slides to illustrate his talk.

Where Shall we draw the line?

By C. J. Chaffins

Absorbing the new engineer into industry and assigning him work we must accomplish, with the assurance that it will be of interest to him, is a task of considerable magnitude and complexity. Factors such as expansion, increased technical requirements, and a limited supply of engineers have all added to the complication of our position. In giving you my impression of the new engineer entering the aircraft industry and his reactions to the many things he encounters I shall mention some of the experiences we have had, some of the solutions we have devised, our future plans, and a few suggestions as to what might be done to alleviate some of the difficulties.

To indicate the size and scope of the Boeing Airplane Company I shall briefly mention a few pertinent facts.

Heavy aircraft has been our principal output; the B-17, the B-29, the Stratocruiser, the B-47, and the B-52 are the best known of our products since the beginning of World War II. In addition, we are manufacturing guided missiles, gas turbines, and analogue computers.

Included in our total payroll of 56,000 employees are 6,100 in our Engineering Division of which 3,900 are technical personnel.

Our Engineering Division is divided into three principal groups: Design, Research, and Administration.

Design Projects are responsible for the release of all information required by our Manufacturing Division to fabricate and assemble a completed airplane. Projects are split into several groups with each responsible for a structural component or function such as radio, electrical, wing structure, body structure, and equipment.

Research is responsible for detailed study of specific problems and development of new ideas. Some of the research units are: aerodynamics, armament, structures, power plant, mechanical equipment, and electrical.

Administration provides services to all units in the Division on such matters as personnel, education, costs and schedules, procedures and specifications, and working facilities.

All of these groups collectively and individually are involved in a coordinated effort to produce as an end result a high quality, high performance article.

Into such an organization we bring the new engineer. We find the problems management must meet in absorbing him are principally "human" problems, as contrasted with the problems of increasing technical "know how." We have solved certain facets of the human problem, but we recognize that a great deal still remains to be done.

One portion of this basic problem which we are studying is that of instability. Large numbers of our new engineers in this day and age are "quick quitters." If these engineers would only remain with us long enough to learn to know their employer and their chosen industry before they start seeking what, from a distance, appears to be a greener field, we believe that they would make better individual progress and a greater collective contribution as engineers. Statistically, we know the man who stays at Boeing two years has only a fraction of the tendency to move as compared with the man who has been here only one year. We believe this fact results from the length of time it takes a new employee to "shake down" and become accustomed to an industrial atmosphere.

The organization of handling and scheduling work is a problem of considerable scope. Unfortunately, when our new employees first encounter this organization they feel lost in its vast size and discouraged by the cold, seemingly impersonal forces that regulate them. What management must find is a way to contact and indoctrinate these people with the realization that the employee has much to gain by proving that he is persistent. This is a problem which engages our imagination and attention to a great extent.

The missing link in the educational development of the young man may be the lack of attention paid to the development of his attitude. This is an abstract term, but I am thinking of his attitude toward his future, the analysis of his purpose, and the reasons for his going to the trouble of obtaining an education. What does he intend to do with his education, and with his life? There must be an objective!

The employer can provide encouragement, facilities, and opportunities, but the employer cannot inject into the individual the necessary desire, the energy, and the initiative to accomplish something with his technical training.

In the short four-year course which is customary in the preparation of the college man, I think in most cases the student's primary interest is in learning natural physical laws. He is learning how to handle them, and he is learning their applicability. He is storing them as tools for his future career, and he is usually intrigued by them to the exclusion of other factors which are going to have an equal if not greater influence on his future success. As he learns these natural laws and how to use them, he might well learn at the same time that industry as it is presently organized is the vehicle for their application.

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C. J. Chaffins, Engineering Division, Boeing Airplane Company, presented this talk at the 61st annual meeting of The American Society for Engineering Education at the University of Florida in Gainesville, June 22-26, 1953.

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The young graduate probably thinks of his employer as an aggregation of buildings, machines, and engineering facilities instead of an organization of people. He may be somewhat confused and frustrated on finding that his coworkers and supervisors are not as reliable as machines. He may then ask the questions, "Why don't these people behave like machines?" "Why don't they observe the same behavior towards natural laws as the machines which we use as tools?" Learning to work with people in the framework of an organization is probably the most important lesson a new employee must learn in his first year or two. If he keeps this objective in mind, then he might be more likely to stabilize. He might realize that he is growing in stature by proving he can work within a given set of human circumstances. In addition, a certain amount of prestige accrues to him by considerable period of association with a recognized company. We must somehow help the young graduate realize that two years with Allis Chalmers, General Electric, Westinghouse, Boeing, Douglas, or Lockheed is really a claim that he has developed his personality to an extent where it might prove more valuable to him than a Master's degree or a Ph.D.

Another factor the college student and potential employee should learn to recognize is the true nature of the tasks before him — recognition of the real problem minus the many misleading side issues.

How can colleges improve a student's ability to recognize a problem and make him conscious of the fact that there is more than one solution? The analysis of problems is a factor in education to which I believe more attention should be given.

One of our engineers recently made an observation that may be of assistance in helping teach students to recognize problems. His suggestion is certainly pertinent. This employee observed that college professors were inclined to penalize students for collective efforts, sometimes known as "cribbing." However, he also observed that when the college graduate was employed in industry, he was penalized by industry for not participating effectively in a cooperative project.

Undoubtedly it is easier to measure the progress of a student by assigning problems which can be solved individually. Actually, we believe that what he needs most to acquire as preparation for productive employment is the ability to work in a group which is chiefly concerned with defining and recognizing a problem, and then achieving a solution through cooperative efforts. I feel sure many apparently brilliant students fail to make corresponding progress in industry because they were graded in school on their ability to work by themselves on problems not too difficult to recognize. A big difference between school and work is that schools are working on neatly defined problems and industry is working on vast projects.

Another trait an engineer should acquire in college is the ability to make decisions. He should realize that decisions are necessary and that every decision involves a gamble. If we at Boeing could enjoy the luxury of making decisions on sure things, our new airplane designs would be trouble free. However, when we roll a prototype out on the field to try it, we anticipate trouble, because in its design we have made decisions, many of which were merely intelligent gambles. In the aggregate, if you make a lot of intelligent decisions, some of them are going to be wrong, but most of them will be right, and you will make progress. If you make no decisions you make no progress!

Along with my emphasis on the human problems in technical employment, I would like to mention the need for continued broadening. We feel sure the young engineer who progresses is going to need an ability to express himself both orally and in writing. I want to go further than just advocating a course in technical English or public speaking. Our problem is much broader; it is intimately tied up with the problem of understanding and communicating with other human beings. The further one goes, the more one realizes that the humanities—literature, history, politics, religion, and art—are essential for a genuine ability to cooperate effectively with human beings. I know the four-year engineering program is all too short to hope men will be graduated who are truly developed in all of these respects. I do not think a student at the age of 21 is mature enough to gain much breadth in such subjects, even if he is kept for an extra year or two of schooling. Much of this maturing must wait for experience in working with people. About all the college should be expected to do is to awaken an interest in the humanities through an introduction to the field. In addition, you can help by letting the student know that his usefulness is related to more than an "A" in your technical course.

When the new engineer comes to Boeing, he is placed in a training program for a duration of two to four weeks depending on his assignment. This indoctrination period provides him with information about the Company, its many departments, and their functions. Its primary purpose is to help him get acquainted with us.

Although new graduates have a dislike for drafting, it is necessary that we all work with drawings, and for this reason, I shall mention something about our drawing system.

In aircraft the requirements for engineering drawings are extremely complex as compared with other industries. We have three basic types: the detail drawing showing one or more separate parts, the assembly drawing showing two or more parts fastened together plus the detail information for each part, and the installation drawing which may be a combination of all three types and, in addition, shows the unit installed in the airplane. Required detail information for each part as instruction to the shop and as a record for ourselves and the Air Force adds to this complexity. We must specify material and processing completely. Relatively few airplanes of any one model are identical, but a record of these differences still must be made.

One of the interesting facets of our operation at the Boeing Airplane Company, and, I might add, at practically any aircraft company, is the use of glass cloth. Glass cloth has been quite common in the industry for a period of four or five years and is the only dimensionally stable drawing material we have been able to find that is translucent, can be rolled for storage, and has other properties similar to cloth or vellum. Under our system, an original drawing of any part that is to be fabricated from sheet metal, extrusions, or materials which are to be cut, sawed, or routed is prepared on glass cloth. The glass cloth

drawing is then placed in a contact camera, and as many duplicates as are required by the shop are furnished on photo-sensitized template stock of whatever gage is desired. Also, the Bruning light table, a large contact printer, provides great facility in the use of glass cloth inasmuch as the bed of the machine has sufficient surface area to permit the photo reproduction of several drawings simultaneously. Completed templates, being the reproductions on metal of the original glass cloth drawing, are furnished to our shop where they may be sawed, cut and filed, or used as desired in making some sort of supplementary tool from which parts shall eventually be fabricated. One interesting fact I would like to point out is that in our production operations you will not find the mechanics making parts by using blueprints. Instead, they will have a holding or alignment fixture. This is done to simplify the job so that it requires less skill and training than otherwise might be necessary, thereby permitting us to use the available supply of labor for maximum efficiency. Substantiating evidence that glass cloth is in popular demand in our own company is its rate of usage, which amounts to approximately 5,000 square feet per month and is gradually increasing.

Another interesting aspect of our operation, is the use of a painted metal template as an original drawing, which we have exploited as much as possible over the past 12 or 13 years. The metal template and the glass cloth end product are essentially the same; however, the metal template is necessarily reproduced by the use of an optical camera. After the glass negative has been prepared, the duplicate template is made by projecting the image onto a sensitized metal and, as with the glass cloth, the duplicate is furnished to the shop where it may be used to the best advantage. Of course, we use a great many machine drawings and we could spend considerable time discussing some of the intricacies of different types of dimensioning, cutting sections, and views. However, these are more or less common drafting practice and even though we have our own variation, I do not believe they are important to our discussion.

You undoubtedly know of lofting as a fascinating subject, a practice commonly used in both the aircraft and shipbuilding industries. It can be described as the development of surfaces such as the hull for a boat, the body or wing for an airplane, or perhaps the shape of an intricate duct used internally in a powerplant structure. There are two types of lofting. The first, which is the most common and the one that has been longest in use, is the cut-and-try method, whereby the trial and error shifting of lines in the three standard views . . . . a plan view, rear view, and side view . . . . will enable one to develop a smooth, faired surface. This type of lofting has been supplemented in the past few years by a second type which is called mathematical lofting. Mathematical lofting has its limitations and is primarily used in developing surfaces where we can use a second degree curve, which in effect is the use of a family of conic sections. In manufacturing airplanes, lofting is an operation absolutely vital to production. Contour lines of all types are drawn or transferred on metal templates, and the cut-out templates used in forming the plaster casts that will eventually serve as the original models for contruction jigs and thousands of formed and contoured parts.

Until recently, practically all of the drafting work at Boeing was done by the new engineer. But now, because of the continuing critical engineer shortage and the increasing amount of technical manpower required to design an airplane, we have established a new program whereby we are implementing our engineer manpower with the use of draftsmen. We have proved to ourselves in the past fifteen months that it is possible to use people with less formal education in the preparation of the many drawings required for our shops to fabricate and assemble an airplane. In establishing this drafting program, we immediately discovered there was not an adequate supply of draftsmen available, and having discussed several methods by which we might obtain additional draftsmen, we came to the conclusion that it would be most expedient to conduct a training program ourselves due to the peculiar nature of our work in the preparation of aircraft drawings.

In selecting our candidates for drafting training, we are making every effort to choose those individuals who are not only best suited to drafting work, but who are most likely to remain with us as permanent employees. Careful interview screening and a battery of aptitude tests play an important role in selection procedures; the evidence of our statistical studies shows these methods have contributed materially to the success of our program. The cold hard fact of this situation is that, at the moment, we accept only 40 people out of each 100 who came to us showing an interest in drafting training. You might say that, in effect, we have taken people "off the street" for this purpose inasmuch as they come from all walks of life. The only basic requirements which have been established are that candidates must be high school graduates and must be between the ages of 21 and 50. However, other factors such as place of residence, number of dependents, and proximity to work receive consideration. We give the draftsman candidate a comprehensive course in drafting and descriptive geometry lasting for a period of five forty-hour weeks. As a supplement to this, we also assign him to a three-weeks course in familiarization, which is designed to acquaint him with the different types of drawings and drawing change procedures and the use of drawings in the Boeing Airplane Company, particularly in the factory.

One significant fact is, that in the period of fifteen months we have, on many of our projects, increased the number of draftsmen to the point where they constitute 35% of our project personnel. In all we now have over 600 assigned draftsmen. This, of course, is a substantial beginning; and we have hopes, as these men gain working experience, that we will be able to use more and more draftsmen, even up to as much as 50% of our project personnel.

You can readily see that with the use of glass cloth, metal, and of course, dimensioned drawings—particularly the first two—that it is essential that the draftsman have a broad general knowledge of shop tools and procedure. In order to provide this knowledge, we are now offering a supplementary series of lectures to acquaint him with the many different types of tools we use in our fabrication areas, such as brake, hydropress, shears, routers, and Yoder rolls. In addition to an expanded knowledge of tools and a thorough indoctrination in the utilization of the drawing by the shops, we are also offering the draftsman supplementary information

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Your Pet Project MAY BECOME A PRIZE PAPER

Jot down the ideas you've had for a long time . . .

Maybe they'll help you think of others . . . Maybe they'll win you one of the five, $100 prizes

Here are the rules:

Any member of the Society may compete regardless of grade of membership.

Papers shall not be highly technical in nature. A clear, concise and interesting coverage is desired rather than complex formulae or derivations. The subject discussed should be of general interest to engineers but should not be of a political or highly controversial nature.

All members of the Society who wish to submit papers in this contest should contact the Secretary as early as possible and not later than February 1, 1954, and request a copy of the rules governing the competition and an outline of the minimum requirements for acceptance of papers. These cover in detail the mechanical make-up which should be followed in preparing and submitting papers for the contest.

Papers must be submitted to the Secretary for acceptance by April 1, 1954. If the Secretary finds that they meet the minimum requirements of the contest, he will forward them to the Awards Committee for review. The papers will be identified by number only. The Secretary of the Society is the only person who will maintain the key to the authors.

If any paper does not comply with such minimum requirements, the Secretary will so advise the author and discuss with him the points which are below the minimum requirements. The papers which are accepted will be forwarded to the Awards Committee for judging not later than May 1, 1954. Papers which have not met the minimum requirements by that time cannot be considered for prizes.

Papers which are accepted will be judged on originality of presentation, editorial merit and value to the engineering profession.

The papers submitted must not have been previously published in substantially the same form. No copyrighted materials shall be used unless permission has been obtained and so indicated. All manuscripts, drawings, etc., are to become the property of the Society and cannot be published without the consent of the Society.

If the papers submitted are NOT of sufficient merit to warrant the award of any or all of the prizes, the Awards Committee reserves the right to award less than the five established prizes or to postpone the competition.

The winners will be announced and the prizes presented at the annual meeting of the Society in June, 1954.

WSE Executive Secretary will furnish you with a complete set of rules and minimum requirements on request.

Its Problems

A State Hospital Power Plant

By Charles R. Bender

Our plant serves a large mental hospital in St. Louis. We have had many problems, some of which have been solved, while many others have us still working. One of the greatest unsolved problems is that of obtaining supplies and equipment. Many valuable hours are spent phoning to secure prices and going through the necessary 'red tape to keep the plant supplied. Often the needed articles cannot be obtained and a makeshift must be used. Sometimes due to lack of necessary articles it is a real problem to keep the plant running.

It is also a problem to obtain and keep qualified personnel due to the lower wage scale paid by the state, and equally hard to operate the plant with the unqualified personnel already on the job. However we have spent considerable time on training programs with gratifying results.

In 1949 the personnel problem was great. Many of the men had never been in any other plant and knew little about plant operation, although there were some good men who were willing to work. Fortunately the Superintendent of the Hospital, Louis H. Kohler, was very anxious to get every department in as efficient a condition as possible and gave me a free hand in the operation of the plant and at the same time helped in every way to obtain competent employees.

Certain fortunate circumstances enabled me to persuade one of the most capable and experienced power plant men I knew, to take a watch engineers job. I immediately made him assistant chief engineer, although it was many months later that through the recommendation of the superintendent he was actually recognized as assistant chief by the state and paid accordingly.

When our maintenance man quit we decided to promote a maintenance man from the ranks. A number wanted the job as it was day work, but we had to have a man who could learn fast and was not afraid to work. It seemed that whoever we picked the rest would claim that we were unfair. Finally we solved the problem by announcing that we would give the job to the man who would attend trade school at his own expense and study acetylene welding. This eliminated all but two so we gave it to the one with the most seniority. This proved to be a fortunate choice and the man became a valuable employee.

We also completely reorganized the working schedule, changing from a 42 to a 40 hour work week, from a four man to a three man watch, established relief crews and added to the maintenance force.

Our plant consists of four 750 hp Combustion Engineering Heine box header type water tube boilers, fired by Laclede Chain grate stokers, generating saturated steam at 135 psi and equipped with two traveling coal larrys and a 1000 ton steel overhead coal bunker.

In the engine room we have seven steam engines. Four are Chuse non-releasing Corliss engines, two generating a-c current at 4160 volts and two generating d-c current at 230 volts. The largest being 400 kw d-c and the smallest a 250 kva alternator. Also two horizontal cross compound Meyer riding cut-off pumping engines and one small releasing Corliss cross connected to a horizontal double acting Reumely Dawley ammonia compressor. In addition to this there are two 45 ton York ammonia compressors connected to 75 hp synchronous motors through multiple V belt drives.

In 1949 the plant was in need of considerable attention. It was subject to frequent downs due to loss of steam pressure. The largest engine had wrecked itself throwing its cylinder head and piston out the door and across the street. The steam lines were leaky enough to blow off your hat. The cross compound pumping engine ran by jerks and the little Corliss engine had no workable overspeed trip, while its cross connected ammonia compressor had no relief valve in the system.

Due to the failure of the large d-c engine, part of the hospital had to get along without current each day so that the little d-c engine could pull the laundry. The small d-c engine ran continuously except for a one-half hour period on Saturday afternoon when it had to be shut down to have its shaft governor greased, at which time the hospital had to be entirely without d-c current. Usually someone was caught between floors in an elevator somewhere in the building.

The method of firing used was not exactly according to the best practice. A short thin fire was always carried, regardless of load. The fire bed being no longer than the combustion arch. The under-fire air was much too strong, blowing the fire to a high temperature right under the arch, and sand blasting it out at a rapid rate. Only one or two tuyres were used and the rest of the grate was practically unused. If there was a sudden increase in load, the fire usually pulled away from the gate and since there was no reserve on the chain, the steam would drop rapidly, necessitating a rapid shut down of all but the generating engines to save the steam for them, and sometimes everything went down. No one seemed to know about putting the combustion control on hand operation and pulling in the outlet damper to prevent the fire from leaving the grate. In cold weather three boilers were used, each with a short fire. If the load fell too low for the three boilers, rather than taking one off the line, the tuyres behind the fire would be opened up and enough cold air admitted to hold down the steam.

One fireman's method was to bring the steam up till all safeties popped, then open all tuyres behind the fire, plus the side doors and blow down the boiler. This he usually kept up until

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Charles R. Bender, chief engineer, St. Louis State Hospital Power Plant, St. Louis, Mo., presented this talk at the 1953 American Power Conference held in Chicago.

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the steam dropped too low to be brought back. If the engineer was not quick in unloading the heating system and the less important engines, the hospital would soon be without power. After repeated efforts to teach the fireman we finally demoted him to coal passer.

Mr. Steidel, the assistant chief, started a reform in firing methods as soon as he arrived on the job. He taught the firemen to carry a boiler on bank. Never again were three boilers used. Most of the time only one boiler is used and the banked boiler placed on the line only during peak winter time loads. The controls of the second boiler are kept on hand and it carries only enough load so that the other will be kept at its most efficient rating. As soon as the load drops enough the second boiler is banked. In this way high carbon dioxide is continually maintained on one boiler around the clock and the other is operated in hand control with the outlet damper pulled in sufficiently to give about 10 per cent carbon dioxide while running and is banked as soon as it is not needed.

To bank a boiler, we merely run in a short thick fuel bed, run the hopper empty, close all tuyres, pull in the outlet damper as much as possible and let a very slight amount of air in under the gate. Nearly full pressure is maintained on the boiler at all times so that it is ready to go on the line in a few minutes in an emergency.

We carry a thicker and much longer fuel bed on the chain of the steaming boilers than formerly and with less air pressure. Much more of the grate is then in service and the fire is not as hot in one spot under the arch. Arches last several times as long and the boilers carry double the former load, also there is no danger from a sudden increase in load as there is a reserve on the chain.

Each boiler had eight steam jets inducing secondary air into the front just below the arch. We removed these and installed four jets in the rear. These jets do not induce any air but pick up air which leaks into the fire. This makes use of air which formerly leaked through the boiler, carrying away valuable heat.

We had some trouble with the tip ends of the blower pipes burning off. We first filled the ends with weld and drilled a 3/16" hole in each pipe. The welded ends would burn off leaving too large a hole. Finally we solved the problem by turning up nozzles on the lathe from old broken grate links. These extended into the furnace and the pipes were kept in the clear.

Firing was greatly improved by the installation of carbon dioxide recorders. To save money, only two were installed for four boilers. Since we never use more than two boilers at one time we connected the carbon dioxide recorders through a manifold which enabled us to use any carbon dioxide machine on any boiler. Considerable trouble was experienced with the carbon dioxide recorder lines eating out with the sulphuric acid in the flue gas. We have lately been trying plastic lines with apparent success.

Formerly, no boiler compound was used other than sodium sulphite for oxygen protection. Zeolite softened water was supplied for makeup. About every six months a boiler would be taken off the line and turbined. Sometimes scale in the tubes would be so thick that the tube turbine could not get through.

Conditions were greatly improved with full boiler treatment, including a daily test. A continuous compound feeding pump was installed feeding directly into the boiler drums. Now, no turbining is necessary anymore and after a six month run the boiler is as clean as it was when started.

We built a home made continuous blow-down heat exchanger at no expense out of an old hydrostatic cylinder oil tank with internal tube bundle made of an old return bend radiator. This saved a couple of tons of coal per day during the heating season, but showed a tendency to foul up with iron oxide from the zeolite water. At present we are trying an amine treatment fed by a home made feeder of the by-pass type.

During the heating season we normally keep one boiler on the line, one on bank to be used during peak loads, one laid up in wet storage, and the fourth laid up dry. The boiler which is laid up wet is kept solid full of water from the continuous blow-down heat exchanger. This prevents external sweating on tubes and headers, also keeps the boiler hot and more nearly ready to go in case of emergency. The boiler is filled with hot treated oxygen free water. After passing through the boiler the water goes to the sewer through a blow-down line.

We experienced considerable difficulty with our 1000 ton overhead bunkers. The unlined steel surfaces were eaten through in several places and had to be patched. Finally, after trying all kinds of paint which would not stand up, we found that waste oil would protect the surface. We get the oil from a nearby filling station and apply it with a broom and 5 gallon bucket. The coal passer stands on the coal and oils out the bunker as the coal is used down.

The Chuse engine, a four valve non-releasing Corliss type, is simple and dependable, yet at times things can go wrong. As was stated before, the largest engine was wrecked.

The cause seems rather unusual. For a time the Chuse company made engines with pistons which were not round. The pistons had two snap rings with both gaps at the bottom. The bottom two-thirds was cut away slightly to allow for expansion. The clearance is not great enough to notice and few knew that the pistons were not round. The piston fits the rod loose enough to be turned back by hand after turning the rod to adjust the clearance at the cross-head. This particular engine never had a good fit between rod and piston and throughout the years it worked a little causing a noise that no one ever found. Finally the noise got bad enough to cause alarm and it was located. The piston and rod were removed and the rod built up with weld and turned down to a press fit. This cured the knock but the piston was not in with the top third up, when the clearance was adjusted and there was no way to turn it on the rod anymore. However the engine ran fairly well for a few months until the rod broke at the shoulder that fits against the piston. The piston then ran the length of the cylinder free, hitting the cylinder head hard enough to take it off and out the door. No one was in the street at the time so there was no loss of life. The piston and cylinder head passed within a few inches of a 4160 volt generator which was running at the time, but no harm was done.

The Skinner engine company sent a man out to supervise the complete overhaul of the four Chuse engines several months later. The wrecked engine was

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Engineering Leadership's Dependence on

Physics and Mechanics

By Dr. L. E. Grinter, MWSE

Important discussions have been taking place on nearly all campuses of engineering colleges during the past year concerning the future trends in engineering education. Since these discussions relate primarily to the professional-scientific core of the engineering curriculum they center around the subjects of mechanics and physics. There could be no professional engineering without these subjects which encompass many of the fields of study and research commonly classified as the engineering sciences.

It is indeed worth while to take time to look into the engineer's responsibility for the advancement of knowledge. For the first two or even three decades of this century the engineer's responsibility for new developments was strictly limited to applications of science and to the development of the art of engineering. He completed the development of great suspension bridges as an extension of Roebling's art without adequately sensing his responsibility for learning more about bridge vibrations and pulsating wind forces. Engineers developed radio partially as an art, but when applications began to outgrow the extension of the art physicists were of aid in establishing basic theories of wave phenomena which gave rise to electronics as we now find it in our curricula.

Physicists were busy in research in the fields of engineering science, i.e., dynamics, elasticity, plasticity, fluid flow, thermodynamics, heat transfer and electronics until their attention was drawn away by their overwhelming responsibility for guiding all the numerous studies and applications of nuclear physics. It seems evident that there is more work to be done in nuclear physics than all the talented physicists can do in our lifetime. Hence, to engineers has fallen the responsibility for furthering our knowledge in the fields of engineering science—and to a large extent this work lies within the realm of engineering mechanics. Either mechanics men must move the field of engineering science ahead or in many places it will remain stagnant and unfruitful.

The question that has arisen simultaneously in the minds of a great many engineering educators is what influence should this new responsibility of the engineering profession have upon the basic training of engineers? A second great influence, our growing responsibility for nuclear energy applications, enhances the importance of this question. Nuclear engineering is an accepted area of employment although we give it no specific place in our usual curricula. Within the area of nuclear engineering there are being studied, developed and rapidly placed into use hundreds of new materials and processes. Our graduates have had no contact with these new developments, and they can have none with the amazing developments that so clearly lie immediately ahead. Over and over we have to ask ourselves the following question: Are we really giving young engineers the basic training that fits them for leadership not today but a decade or a generation ahead? The extent to which our curricula resemble those of the 1930-1940 era contrasted to the extent to which engineering methods of 1975 will diverge from engineering practice today gives us some measure of present inadequacies in engineering education. It would be comforting to feel that this lag in the educational process is normal and natural, and that young engineers have always had to overcome such handicaps. This would be true if engineering and science had been passing through a natural evolutionary period of development. Instead, the greatest scientific revolution of all time took place with the development of nuclear power. Engineering as applied science did not feel this revolution as early as physics and several other sciences. However, engineering is now being strained to the limit to fulfil its obligation to apply nuclear power to both war and peace. Engineering educators cannot disregard these forces, which, with the persistence of gravitation, continue to draw engineering education in the professional-scientific direction.

As engineering educators face the realities of the great influence that modern physics will soon be playing in the field of engineering applications, I believe they will insist that their professional-scientific students study nuclear

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Dr. Grinter, dean of the Graduate School, the University of Florida, presented this talk before the 61st annual meeting of The American Society for Engineering Education in Gainesville, Fla., held June 22-26, 1953.

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physics and physics of the solid state at the undergraduate level. This does not seem like a very revolutionary requirement, but I suspect that it may turn out to be. The reason lies in the straddling position of engineering education which has been equally the province of the professional-scientific student and of the general-professional student. The latter has interests in the border areas between the profession of engineering and (1) other professions such as business, agriculture, law, real estate and management, or (2) between engineering and certain sciences such as biology, geology or geophysics, or (3) between engineering and the technologies of production, construction, operation or maintenance or other specialized engineering technologies. The education needed is not sub-professional training but rather general-professional engineering education which has heretofore been combined in the same classrooms with professional-scientific education in engineering. Now, if the professional-scientific student must be given more physics which requires more mathematics and additional advanced mechanics, electricity or thermodynamics to put his background of physics to scientific use, it will be evident, I believe, that the general-professional student will be unfairly or unrealistically treated if he is asked to follow exactly the same curriculum.

It seems clearer year by year that professional-scientific engineering education has been under a severe handicap due to the limitation that general-professional training has set upon the science background of the undergraduate curriculum. Or perhaps it is better said that professional-scientific engineering education has been handicapped by being tied to general-professional education for the first four years of the 5, 6 or 7-year period that it takes to train a professional-scientific engineer. By starting earlier, with the professional-scientific phase of engineering education more strongly emphasized, greater progress would be achieved at the end of five years whether this period had been planned as the completion of the bachelor's or master's degree.

At present we are building considerable specialization in the art of engineering into the curriculum at the undergraduate level in order to justify the use of the professional engineering designations or specializations of civil, mechanical and electrical engineer. These specializations have less significance today than they had a generation ago when one could accomplish very little until he knew the specialized art involved. In the future even more than today we can expect the fields of engineering science to be more significant as fields of specialization than the professionally accepted groupings. Our approach to a solution to this problem is to forget the traditional requirements of a narrowly professional nature and to let the student acquire the degree with professional designation of civil, mechanical or electrical engineering largely upon the basis of education in the field of engineering science. At a group meeting of twenty mechanical engineers interested in the field of mechanics I publicly noted that all except two had been trained as civil engineers. This is sufficient proof, I feel, that we are overly specialized in our restrictions upon the award of designated undergraduate degrees in engineering.

It is not desirable that we decide universally to adopt or not to adopt a new type or length of curriculum. It *is* important that we publicly agree that there are two overriding objectives of engineering education, professional-scientific and general-professional, which are diverging so rapidly that a single curriculum is no longer adequate to serve both. When this point is clearly understood and accepted, solutions will soon appear. Some entire schools may adopt the professional-scientific objective, as indeed a few have already tried to do. Others may set their objective as that of general-professional education in engineering. If the distinction is properly recognized by the engineering profession, accreditation of institutions with such divergent objectives would be based upon different standards.

Adjustments will be complicated by the fact that nearly all state institutions and probably many private ones will feel a strong obligation to fulfill both the need for professional-scientific engineers and for general-professional engineers. In these institutions many solutions will doubtless be tried from one extreme to the other. When such matters are considered in your own institutions I believe that you should emphasize the fact that the professional-scientific objective in engineering education cannot be met adequately by graduate study alone. You might also consider whether a dual program cannot be based more effectively upon a well considered curriculum to meet professional-scientific objectives with elimination of certain courses and substitutions for others to achieve a realistic 4-year curriculum for general-professional students. Where compromises are to be

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Accrediting Engineering Curricula

By N. W. Dougherty

Twenty years ago the engineering societies began to consider the possibilities of accrediting engineering curricula throughout the United States. The American Institute of Chemical Engineers began in the twenties to examine curricula and accredit them for their own listing. The National Council of State Boards of Engineering Examiners prepared a list before Engineers' Council for Professional Development had set up its procedures. One of the reasons for the organization of Engineers' Council for Professional Development in 1932 was the accrediting of engineering curricula. The Committee on Engineering Schools was organized at the first meeting and then at the first annual meeting of the organization, the Committee reported a procedure by which it proposed to accredit engineering schools. First inspections began in 1935 and by 1937 the inspections were in full force throughout the United States.

During the early days of ECPD, Dr. Karl Compton, then president of Massachusetts Institute of Technology, acted as chairman of the Committee on Engineering Schools. He and his Committee outlined the general philosophy of ECPD accrediting.

The Philosophy of Accrediting

From the very first it was realized that all curricula within the same school were not of the same calibre. It was, therefore, decided to inspect and accredit by curricula rather than by institutions. This decision had a far-reaching effect because it sent the inspectors into the schools not only to look at their general finances, admissions and organization but to actually inspect what was going on within the several curricula themselves. No blanket accreditation was given.

Inspection committees went even farther. They inspected the supporting departments of mathematics, chemistry, physics, English, economics, geology, etc. These inspections of supporting departments probably led to some of the criticisms of the inspecting procedure in general. This I will discuss a little later.

Engineers' Council for Professional Development was a conference of five engineering societies: the American Society of Civil Engineers, the American Institute of Chemical Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining and Metallurgical Engineers and the American Society for Engineering Education, and the National Council of State Boards of Engineering Examiners. Later was admitted the Engineering Institute of Canada. These eight bodies have comprised Engineers' Council for Professional Development.

In the early days of accrediting, it was obvious that the curricula represented by the societies should be inspected and accredited. From the very beginning, it was thought that additional curricula should be inspected and added to the list. There were variations of these major fields, such as mining and metallurgy. The question would, of necessity, be raised as to whether these should be accredited as separate curricula or one curriculum. By 1938, sixteen different curricula had been accredited.

It was not long before the institutions began to present such programs as engineering physics, geological engineering, engineering mathematics and geophysical engineering. These programs apply engineering and mathematical principles to fields not normally counted as major fields of engineering. The problem is still before the Education Committee and will probably be solved within the next two or three years.

From the very beginning, it was understood that no curricula would be accredited that were not degree-granting departments in engineering and been in existence long enough to have graduates. As a matter of fact, instructions to the committees are that they inquire into the success of the graduates of the several programs.

What Criteria Are Involved?

The early committee set the general tone of the inspection and accrediting procedure. There must be intellectual atmosphere within the institution. Effort was made not to standardize, but to detect an intellectual atmosphere and climate. The early instructions to an inspector was to avoid giving recommendations which would tend toward standardization. Committee members could discuss problems with the different departments being inspected, but it was not thought good for the inspectors to recommend standardization, number of hours, and other activities which departments should undertake.

It was of paramount importance that there be competent faculty and enough faculty members to insure stability. A one-man department was looked upon with disfavor for the simple reason that if one man left the institution, the whole program might be changed so radically that it would not be the same program which was accredited. Faculty members should show evidence of intellectual activity by their contributions to the technical press, the writing of books, and the preparation of manuals and instructions for their students. It is also considered evidence of good atmosphere if the faculty members were members of their technical societies and took an active part in the American Society for Engineering Education.

The committee realized that there could be excellent faculty members who were not writers or joiners, yet these, generally, were counted as evidence of activity in the field of development of the engineering profession.

There, of course, must be a minimum of facilities, such as laboratories, libraries, etc. The committees were expected to examine the laboratories, look at laboratory reports, laboratory man-

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N. W. Dougherty, dean of Engineering, the University of Tennessee, presented this talk before the 61st annual meeting of The American Society for Engineering Education held at the University of Florida in Gainesville, June 22-26, 1953.

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Where Draw the Line

(Continued from Page 5)

about some of the techniques used in purchasing, production, tool design, and tool fabrication.

As the draftsman works with us, he continues to learn. I am sure you can readily see that, over a period of three or four years, he is going to become a very valuable asset to our Company and to the Engineering Division in particular.

Because of the skill and ability that must be developed, and because of the great amount of detail that must be absorbed in order to become a competent draftsman, I think you will agree that it would be completely out of the question for the universities and colleges to attempt to include such an extensive training program in their curricula for engineers. In the first place, the engineering curricula is already so heavily burdened with technical subjects that there is not sufficient time; and, secondly, to provide training in several industries which will give the student a well-rounded background, regardless of where he may practice his profession, would be an insurmountable task. In any event, it is quite possible through the drafting training medium to relieve the engineer of the burden of making detail drawings and to use him to the best of his ability in learning the technique of design.

It is our hope that as we pursue this program the engineer will be more content because he is not required to prepare drawings, and the draftsman will become a skilled craftsman and will make better drawings than were made previously.

This transition in the use of engineering manpower is still in progress and, although we are making great steps toward solving our problem of having an adequate supply of people to make detail drawings, we nevertheless have the problem of providing the engineer with an ample background for undertaking design assignments.

As a supplement to his initial three weeks of familiarization, we will, in addition, offer him a series of lectures which will be of two types. First, there will be the lectures of general interest, encompassing activities of considerable scope within the company. For example, we might have a qualified high-level speaker from the Production Department talk to a group of our engineers to tell them of the method of operation of the Production Department and its function as related to other departments, particularly Engineering. Second, there will be specialized lectures directing his attention toward subjects such as the use of fasteners, spot welding, brazing, riveting, and machining. We will also include finishes, processes, and topics of general interest which will not only acquaint the engineer with the method of operation in our various shops and divisions, but also will place him in a better position to design for maximum efficiency and producibility in our shops.

I have hoped in my brief picture of engineering manpower in an industrial setting to bring out a few of the practical problems confronting us, and to describe some of the working solutions we have devised for those problems. However, the solutions to a great many problems, as I have suggested, lie beyond the power of industrial resources and organization. These are the problems of equipping an engineer with effective, useful knowledge and abilities, as well as answering the "human problems" that I have mentioned. It may seem that I am placing too great a share of the burden on the educator's shoulders, but it does appear true, nonetheless, that the problems we encounter are, in a broad sense, those of education.

In order to reach the solution that we vitally need, we must first attain a full understanding of what we actually mean in referring to our "problems." With that accomplished, and with an understanding of our respective responsibilities, we may, in either sense, be better prepared to draw the line. In order to clarify my picture of industry let me continue with some ideas on "fundamentals," and specifically with some views on the fundamentals of graphic representation.

In measuring technical competence, we must recognize that each school has planned a program. This program includes some balance between emphasis on fundamentals and emphasis on specialties. To illustrate what I mean by fundamentals, consider the field of mechanics. Here, the fundamentals include the analysis of stress in terms of tension, compression and shear, the measurement and calculation of stress, the distribution or flow of stress through various materials and shapes, the study of elasticity and vibrations. My idea is that a man who is well grounded in fundamentals such these can successfully enter employment and undertake the design of items as varied as tunnels, bridges, aircraft, or locomotives. He has mastered general principles which may quickly be applied to a variety of specialties. If, on the other hand, he has specialized in reinforced concrete at a sacrifice to an understanding of fundamentals, he will have quite a conversion problem in the event he wants to shift from the design of concrete structures to the design of aircraft.

This comparison between specialization and fundamentals may also be illustrated in the field of graphic representation. We in the aircraft industry certainly value the ability to do drafting work. However, we realize it would be inefficient to try to teach your students to be prepared to do drafting work for Boeing. If they were taught to be

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good draftsmen for us, they would not suit the Bureau of Reclamation, the U. S. Engineers, or North American, Douglas or other manufacturer. By fundamentals in this field I mean a thorough understanding of the means for graphic representation, orthographic projection, sections, auxiliary views, isometrics, and descriptive geometry. He might learn a little about dimensioning but most of this is better learned through his employer since systems vary to a great extent. As you know, we even get along without dimensions on most of our drawings. We do value ability to make rough, free-hand sketches; and it would be ideal if every engineering graduate were a neat, careful draftsman, but I feel sure industry is more in need of fundamental understanding than of such specialized skills as these.

Specifically, the separation of descriptive geometry from drawing itself, the exclusion of lofting, the absence of a course in free-hand sketching, and over-specialization in drafting practices such as the preparation of ink drawings and the technique of drawing pictures of completed parts or assemblies are some of the items which might be modified or corrected. Along with these points for consideration, we might also include the use of elaborate sets of drafting instruments, many of which are superfluous, and some of which, by our standards, are inadequate in holding to close tolerances.

Perhaps I can elaborate on some of the points I have just mentioned. A survey of the many drafting techniques in use today, I'm sure, will bring about the realization that the demand for ink drawings is gradually diminishing. In any event, the preparation is a task for a draftsman, not an engineer. In the aircraft industry in particular, you will find that all drawings are prepared with pencil for ease of erasure and ease of maintenance, and that these drawings prove quite adequate for all purposes.

The technique of making a very complicated detail drawing of a generator, a carburetor, a distributor, or some other piece of mechanical equipment, which no doubt has been dissected to show a cross-section, is a time consuming operation, and it is questionable that the time thus expended is worthwhile. This sort of an approach is, for the most part, in complete conflict with an experience the engineer might have in the preparation of drawings, regardless of what industry the engineer may be engaged in. It is our common practice to design things before they are fabricated rather than after.

The use of lofting is quite common, as I mentioned before, in the aircraft industry and shipbuilding in particular, but it is also used in the automobile industry and other industries where it is necessary to describe surfaces in three dimensions. This technique which has been in use for a great many years has, strangely enough, been ignored by many of the colleges engaged in formal drafting training.

A practice that is quite common, and perhaps not too realistic, is the presentation of descriptive geometry as a subject separate from drafting. We have found in the training of draftsmen that descriptive geometry becomes much more coherent and understandable to the individual when it is presented in terms of practical application. For example, in illustrating the intersection of two lines in space, we have the draftsman run cables through a bulkhead rather than draw lines which have no direct relation to anything with which he is familiar and which are completely disassociated with the use to which he will put his knowledge at some future date.

The importance of free-hand sketching to an engineer, of course, is merely an illustration of the time-worn proverb that one picture is worth a thousand words. The ability to illustrate the essentials of an idea quickly and comprehensibly on a blackboard or on a pad of paper is important to the man who must rely on the understanding of others in his work, and the man who has this ability certainly has a valuable tool at his disposal.

As a possible solution for eliminating or at least modifying over-specialized and impractical material in some of these fields we have discussed, I might suggest a careful study be made of the possibility of injecting descriptive geometry and drafting into such courses as machine design, structural design, and shop practices. An examination of educational practices plus a comprehensive study of the demands of industry might suggest the appropriateness of a composite engineering drafting course which would point out some of the related general aspects of drafting, descriptive geometry, free-hand sketching, and lofting, and at the same time, eliminate much of the tedious detail that has been all too common in past practice.

In addition to continued concentration on fundamentals, let us also give adequate thought to ways of encouraging proper attitude and perservance in the under-graduate, and furthermore, let us devote some effort to provide him with a better understanding of human relations.

Each day in this rapidly changing world we are confronted with new problems, new techniques, and new decisions to be made; consequently, it is essential that we review our program, whether it be academic or industrial, and direct our efforts toward keeping step with the everyday changes and modifications. We must include for consideration not only the question, "Where shall we draw the line today?," but we must devote adequate thought to, "Where shall we draw the line tomorrow?"

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Power Plant

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rebored, fitted with a new round piston, new cylinder head and placed back in service.

After the overhaul all four engines ran badly and the tool marks, instead of wearing out continued to score deeper in the valve chambers. We found that the engines needed a heavy oil compounded with 9 to 10 per cent acidless tallow. For a time we had to cook up our own tallow from our butcher shop to enable the engines to run. However, No. 4 engine scored its crank-end admission valve so badly that no oil could lubricate it. It got so bad, something had to be done. We draw-filled the valve smooth, removing all score marks. Then we filed the valve chamber with a short piece of a file. After all marks were filed out we coated the valve with rough grinding compound and two men gave it a back and forth and rotary motion in the chamber for two days. It smoothed up and has been running very well ever since.

Our engines are equipped with the inertia type shaft governor. The regulation is excellent as long as the governor pins are well greased. Since we supply our own x-ray current, our regulation has to be good. When they installed a new a-c extractor in our otherwise d-c laundry, trouble was caused every time the extractor was started, as it starts directly across the line and draws a very heavy starting current. With some experiment we found that an auto chassis grease lubricated the governor pins best and lasted longest.

Although the four engines are all the same make and all use the same steam, each one has its own individual troubles and sometimes they are very hard to find. No. 3 engine developed a mysterious knock when the a-c load increased. We thought it was everything from main bearing to a loose piston, but finally found that the crosshead and crank bearing boxes did not fit tight enough in the connecting rod, and received an up and down motion because of the wedge. The trouble was fixed when we shimmed up hard under both boxes with a stainless steel shim.

Indicator cards showed that the cross compound pumping engines were cutting off so soon that the low pressure side was going down to a vacuum. Lengthening cut-off on high pressure cylinders gave smooth operation.

In 1949 only one a-c engine had a speed changer. This consists of a small motor in the flywheel which adjusts the governor and is controlled from the switch board.

To synchronize the engine it was necessary to raise or lower the speed of the one with the speed changer to suit the one without. In order to have 60 cycle current it was necessary to install another speed changer. This we did purchasing a second hand speed changer from a municipal plant that went diesel. We then mounted an electric clock near our battery operated clock and instructed the engineers to follow the battery clock by varying the speed of the engine. One engineer invented a better way. If on the night watch he let the time get off a few minutes he merely set the electric clock with the battery clock. To cure him I had to place an electric clock in the maintenance shop of the hospital unknown to him. After that he never could figure how we knew when he was tampering with the clock and always blamed the oiler for snitching.

Our electrical distribution system consists of d-c cables in duct with closely spaced manholes, but the three phase four wire 4160 volt system which was added later, wanders all over the lawns only a few feet underground in parkway cable. No one knew exactly how it reached its various destinations.

Two years in succession the cable to the nurses home and employees building broke after an extended hot spell. One time under a side walk and another under the concrete street. For a time it was necessary to lay a length of 4160 volt parkway along the street to temporarily supply the buildings, until an underground line could be pulled through some extra ducts in the d-c system. Later we ran a second line from the plant to the hospital through d-c ducts and so arranged the switch gear that all the load could be thrown on either line.

One day Mr. Steidel noticed a mental patient sweeping garbage from the loading platform down an electric manhole onto a 4160 volt line. The man in charge of the patients told me they had been doing it for thirteen years and just supposed it was a sewer. The garbage ran through some empty ducts smelling up the power plant after every rain but I never knew where it came from. We cleaned out the manhole getting out a dozen barrels of rotted garbage which we washed into a sewer with a fire hose. A patient watching said, "They take sewage out of one sewer and put it in another, looks like they ought to be in here."

We expect to build a new laundry soon which will be powered with a-c current. We do not have sufficient a-c capacity to carry it as our present laundry uses d-c current. The cheapest way out of the difficulty seemed to be a high speed 150 kw generator belted to the flywheel of our large d-c engine. We will use a flat belt drive with idler. The switch board will be large enough for a 700 kw unit as we hope to have a uniflow engine some day in the near future. We favor this due to its economy.

The shaft of the engine would extend to a small d-c generator so that the small remaining d-c load could be handled making it necessary to run only one engine. This would put the rest of the engines on a standby basis.

Our fireroom combustion control equipment is electrically operated and the fireman is in trouble if the current fails. A little one kilowatt air-cooled generator had been installed in the fireroom. It was supposed to start automatically and take over the control board load in case of power failure. However it seldom worked in an emergency. We overhauled an extremely small vertical steam engine which we got from a laundry junk pile and set it up on a little concrete foundation in the fireroom, belting it to the one kilowatt generator. The generator hung on

(Continued on Page 16)

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(Continued from Page 15)

the gasoline motor's crankshaft so we had to replace the flywheel with a small pulley and run motor and generator both. The gas engine's piston, connecting rod, valves, etc., were removed and the crankpin weighted for balancing purposes. Now any time there is an emergency the fireman opens the throttle and the lights come on.

Using exhaust steam in summer time is always a problem in a non-condensing plant such as ours. We changed a number of water heaters throughout the buildings from live to exhaust steam. Also put a whole building on exhaust steam and saved a tremendous amount of coal. Where the lines were too small, provision was made to switch back to live steam in colder weather.

Due to better firing methods, use of more exhaust steam, repairing of leaks and a cheaper coal, our fuel bill dropped from $110,000 per year in 1949 to $67,000 per year in 1952.

We still look forward to a greater utilization of exhaust steam in the non-heating season and are thinking of trying the absorption type of air conditioner. The type we expect to try will use exhaust steam at zero pressure, comes in packaged units and can be hooked to a steam radiator line. Water under vacuum is the refrigerant and lithium bromide is the absorbent.

We hope to see the day when electric and steam loads are so nearly balanced that the waste of exhaust steam in summer will be at a minimum.

With a plant such as ours an engineer will certainly be busy, but at least he never has a dull moment.

Physics and Mechanics

(Continued from Page 10)

made it is probably less vital if they are made for general-professional students whose objectives are naturally less well defined and therefore less influenced by educational gaps than are the objectives of the professional-scientific group.

The Committee on Evaluation of Engineering Education can go little further than to clarify the conflicting issues that are struggling to be recognized in engineering education. Traditionally our institutions fortunately are free to reach their own decisions. I do not foresee or urge an immediate radical change in the pattern of engineering education. I do urge a fuller consideration of the need for a much larger percentage of young engineers well trained to enter the professional-scientific side of engineering where they will use their talents to work with and to interpret the work of physicists, chemists and other scientists for the purpose of making appropriate applications and to contribute by their own research to the advancement of the engineering sciences.

In order to increase the percentage of such engineers we will need curricular adjustments at the undergraduate level with increased emphasis for particular individuals in the study of mathematics, physics, chemistry and the engineering sciences. We will also need more careful selection of new faculty members who will lead our institutions in the long term evolution of engineering education. If we recognize a shortage of science background in engineers today, one obvious aid is to pick faculty members whose training has emphasized the scientific approach to the solution of engineering problems. The result should be to strengthen the more scientific side of the engineering profession without loss in continuity of those magnificent contributions that the art of engineering has produced.

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On Training—
Letters from Leaders

Dear Mr. Becker:

This refers to your letter of August 31 to Mr. ..... in regard to the educational needs of engineers.

We are in agreement with the view expressed in various quarters that the technical training of engineers should be supplemented by substantial emphasis on non-technical and cultural subjects. The particular courses selected for this purpose are of less importance than is the emphasis on developing an understanding of people and the cultivation of personal traits which will assist in contacts with others.

It has been our observation that the engineers most likely to progress to supervisory or executive positions are those who, in addition to being technically competent, have a lively interest in people and in fields other than those in which they have specialized. These interests tend to give them a warmer personality and a broader perspective.

Another asset to the young engineer is the ability to visualize the economic aspects of the projects with which he is associated so that his proposals are economically sound. Coupled with these, a facility of expression, both oral and in writing, is of distinct value. Your suggestion of the desirability of business sense is well taken, but we would question the extent to which this could be developed in college.

Many more attributes could be listed but we realize that the main portion of an engineering course must be devoted to basic technical subjects. Nevertheless, we are convinced that the cultural and humanistic development of the engineer, both in college and afterward, is of major importance in his future progress.

If a report of your study is prepared for general distribution, we would appreciate receiving a copy.

Very truly yours

Accrediting

(Continued from Page 17)

uals, and student work. They were to examine the libraries, ask the librarian who was interested in books, to determine whether the atmosphere was one of studious application or one in which books did not count.

There must, of course, be ample financial support to protect the institution against lean years or against loss of students. An institution which depends wholly upon student fees was not counted as stable as one which had good state support or adequate endowment.

Inspectors reviewed the content of curricula, going over the whole program with members of the staff, asking questions regarding particular courses—the content, textbooks, types of reports required, etc. It has always been counted very important to discover what was going on in the classroom and the laboratory and the reactions of students to the instruction given them.

Inspectors examined course outlines, examination papers and examinations. They asked for samples of student work showing students' papers with failing marks, with just passing marks, and with good marks. After all, the educational process is for the benefit of the student, and it is the effort of the inspector to determine whether or not the student is growing from a freshman to a beginning engineer at his graduation.

Not only is the inspector interested in the facilities, courses, and so on, but he is interested in what the graduates have done after they have left the school. Many schools have very good records of graduates' performances. Others have meager records. It happens that at the present time graduates from all institutions are finding excellent employment in industry because of the great scarcity of engineering students.

Who Is Inspected?

Engineers' Council for Professional Development decided early in the inspection procedure to visit only on the invitation of the institution itself. There was no desire on the part of the engineering societies or the National Council of State Boards of Engineering Examiners to go into schools which did not wish to be inspected. The actual inspection was to be made by members selected by the professions themselves. Each member of Engineers' Council for Professional Development, except the Canadian Institute, named a series of inspectors in the several zones of the United States. The Chairman of the Committee in each zone normally calls upon the members of his zone to do the inspection. In the early days of 1935 and 1936, the chairmen of committees of all zones aided with the inspections in New England and the Middle Atlantic states in order that there might be uniformity. Uniformity is again insured because the Committee reports are reviewed by the whole Committee on Education.

Visits to the campus are made at the convenience of the institution and the members of the delegatory committees. The chairman of the committee gets in touch with the institution and arranges dates for the inspection. The inspectors spend from one to two days at the institution inquiring into the many matters suggested under the criteria of inspection.

After the visit they make reports to the Committee on Education and it, in turn, reports to ECPD. Work on the Committee on Education is a rather strenuous activity. All reports are reviewed at meetings of the Committee and the recommendations are made to ECPD itself. No delegatory committee or even the Committee on Engineering Education can accredit a program. This is done by the council of Engineers' Council for Professional Development. The whole process is highly confidential. Reports are made only to the Committee on Education and these are counted confidential by the Committee itself. The reporting of accredited curricula in the annual reports of ECPD show only accreditation and not whether it was provisionally accredited or whether it is fully accredited. As far as the public is concerned, a provisionally accredited program has the same standing as a fully accredited program, the only difference being that an inspector is expected to return to the institution after a short period of time to see if the desirable progress has been made toward the full accreditation.

After the findings of the Education Committee are presented to ECPD and acted upon by the Council, the secretary of ECPD notifies the institution of the action of ECPD. Detailed information may be given by the chairman of the Education Committee or by the regional chairman. Usually, the regional chairman is asked to prepare a letter to the institution if the accreditation is provisional rather than full accrediting. In any case the administrative authority of the institution may ask for detailed information, and it will be furnished by the regional chairman from the reports of the inspectors who visited the institution. Ordinarily, verbatim reports of the inspectors are not furnished the institutions because it is desirable to have the inspector report confidentially to the Education Committee of ECPD. It is not desirable to send derogatory statements to the institution, and it is undesirable for the committee member to include derogatory statements unless they are absolutely warranted.

Accrediting has become so general in the United States where societies and agencies of particular courses are requesting the institutions to receive them to accredit their programs that the colleges have organized the National Accrediting Association which has been examining the general problem of accrediting with the idea of reducing some of the visits to the several campuses and particularly the tedious questionnaires that are now being required.

At first thought, it seemed possible for some regional agency to accredit the whole institution and thus let this accrediting provide for all the needs of all the agencies needing to know about curricula. After study of the programs of the several agencies the regional accrediting associations which were to do the accrediting as recommended by the National Council of Accrediting has been working cooperatively with such agencies as Engineers' Council for Professional Development to develop procedures which are desirable to get detailed information about courses and, at the

(Continued on Page 18)

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(Continued from Page 17)

same time, avoid great duplication of information by the institutions.

Such matters as financial status, general operation, cost and size of endowment, books in the libraries, work in basic departments such as math, physics and chemistry, might well be inspected once and then not have to be inspected by each professional agency which wishes to get information regarding professional programs.

At the present time, there is an effort to develop cooperative inspections to avoid duplication. It is probable that within the next two or three years better procedures will be developed. It is further probable that Engineers' Council for Professional Development will continue the type of accreditation that it is undertaking. It is so desirable that curricula be accredited rather than institutions that it hardly seems feasible for one inspection to take care of medicine, law, all phases of engineering, and other professional fields.

The work of Engineers' Council for Professional Development has been outstanding in the field of accrediting. Excellent records have been accumulated. D. C. Jackson in 1939 wrote a report on engineering curricula and determined by the reports of delegatory committees. Much improvement has been accomplished throughout the United States. The problem of fringe curricula is under consideration and will be solved within the next two or three years. The problem of inspection will be simplified during the next few years and, in all probability, it will be generally recognized that the inspections of ECPD are fair and that they are beneficial not only to the institution, but certainly to the constituent bodies of Engineers' Council for Professional Development.

To Hold Fuel Meet

The American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers will hold their annual Joint Fuels Conference in the Grand Ball Room of the Conrad Hilton Hotel in Chicago on Oct. 29 and 30.

The program covers major developments in the field of fuels and will summarize the midwest oil, gas and solid fuels situation in a comprehensive way.

Civil Engineers Select Wonders

What are the seven engineering wonders of the United States? The more than 36,000 members of the country's oldest national professional engineering organization, the American Society of Civil Engineers, are seeking, in their 74 territorial sections, to determine the seven engineering wonders of their respective areas. Thus far, nine have voted their selections.

Since civil engineering, through conception, design and development, is responsible for many vital factors of civilization, its Society members have a broad and varied field on which to vote. Significantly, bridges seem to have engaged the major appreciation of the balloting engineers in several instances.

The Society is divided into thirteen technical divisions—air transport, city planning, construction, engineering mechanics, highway, hydraulics, irrigation and drainage, power, sanitary engineering, soil mechanics and foundations, structural, surveying and mapping, and waterways.

Some sections cover territories far more extensive than denoted by their names. Top results in the sections thus far reporting are as follows:

Cleveland: Terminal Tower Group, bringing railroads to Public Square and revealing foresighted planning.

Cincinnati: Suspension Bridge, finished in 1866, still effective, believed first link between North and South completed after the Civil War.

Los Angeles: Colorado River Aqueduct.

New York: George Washington Bridge.

St. Louis: Eads Bridge across the Mississippi.

Sacramento: Trans-Sierra location for the Central Pacific Railroad.

San Francisco: Golden Gate Bridge.

Tacoma: (for Northwest) Grand Coulee Dam.

Washington, D. C.: Major L'Enfant's city plan.

In a farewell address to the American people on November 27, 1952, Sir Oliver Franks, retiring British Ambassador to the United States, described the "wonders" he had observed in this country as being:

"The San Francisco Bay bridges; the Chicago river, where man reversed the flow so that a ship can sail from the Great Lakes down the Mississippi and into the Gulf of Mexico; Grand Coulee Dam; New Jersey Turnpike; New York Skyline; Los Alamos—and I wonder if you would include as the seventh the largest office building in the world, the Pentagon, that immense monument to man's servitude to the desk."

The "Seven Wonders" of the ancient world were the Pyramids of Egypt, Hanging Gardens of Babylon, Phidias Statue of Zeus, Temple at Ephesus, Tomb of Mausolus, Colossus of Rhodes and Pharos lightship at Alexandria. All except the Pyramids have been destroyed.

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Western Society of Engineers

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Crerar Library

News and Notes

The President of the Crerar Board of Directors has announced the election of Mr. Herbert P. Sedwick as a Director of The John Crerar Library. Mr. Sedwick's long and active association with WSE will be of great value to the Library in the planning and direction of its services to the engineering profession.

* * *

Several members of the chemical literature section of the American Chemical Society are assisting the Library in its study of classification of chemical publications. An informal committee meeting on the subject was held at the Library during the ACS Convention and the classification of chemistry was a topic of discussion at one session of the Convention. Crerar's immediate interest is the improvement of its subject catalog in order that the collections may be more readily and completely available. Broader implications include the need for such improvements in many libraries and the future development of coding techniques in punched card and other selection devices.

* * *

A number of treasures in the Library's medical collections were borrowed by the Milwaukee Art Institute for an exhibit on "The History of Medicine in Art." This extraordinary exhibit is open to the general public from September 11 to October 25, 1953. This is probably one of the most extensive exhibits in the field of medicine in art that has ever been assembled and the Crerar Library is pleased to have a small part in it. As soon as the new elevator installation is completed for WSE, the Library will establish a regular series of exhibits on the history of engineering. These will be located in the lobby of 84 East Randolph Street. Similar exhibits have been set up for medicine on the 9th floor, for chemistry on the 4th floor, and for classics of science in the lobby of 86 East Randolph Street.

* * *

During the third week of August a Conference of Science Literature Specialists was held at Columbia University, New York City. Sessions were devoted to indexing and abstracting techniques in various fields of science, theory and developments in mechanical literature searching, and preparation of research reports. Crerar was represented by its Associate Librarian.

* * *

"Abstracting and Indexing Sources for Literature on Metals and Metal Fabrication" is the title of a paper to be presented at the National Metals Exposition, Cleveland, Ohio, on October 22. Mr. Ellis Mount, Research Information Service, will survey publications currently available, examining them with reference to scope, coverage, promptness of reporting, and general adequacy. It may be added that in an objective sampling, *Crerar Metals Abstracts* was found to have a considerable edge on the rest of the field within the limits of its coverage; Mr. Mount is thus faced with the problem of stating the truth without sounding like a traveling salesman.

Sykes Resigns as Housing Head

Wilfred Sykes, honorary member of WSE, who was formerly president and is now chairman of the finance committee of the Inland Steel Co., has resigned his post as chairman of the Chicago Housing Authority.

Until Mayor Kennelly picks a new one, Henry Kruse, vice chairman of the Authority, will act as chairman.

Sykes had been a member of the Housing Authority since 1950 and chairman the past six months. In his letter of resignation to Mayor Kennelly he noted that he had accepted the position as chairman for that length of time only.

Regarding the housing situation in Chicago Sykes says that there are 20 square miles that should be cleaned out. He says also that there has never been enough money to more than scratch the surface in rebuilding the slums.

Sykes says that he doesn't consider public housing the solution to the slum problem and that he is not especially in favor of it.

He says that he plans to leave Chicago permanently early in 1954 for San Francisco, but will resign as chairman of the finance committee of Inland Steel before he leaves.

Wilfred Sykes, HM WSE

From 1941 to 1949, Sykes was president of Inland Steel. Since 1935 he has been a director.

He was president of the Chicago Association of Commerce from 1947 to 1948.

Sykes joined the Western Society of Engineers in 1936. He has served as trustee from 1948 to 1951.

In 1950 Sykes was the recipient of the Washington Award.

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The material is wood, of course. And the fact that it has been a product of such long and accepted use means that many home owners and home planners may have actually lost familiarity with its properties and merits, according to the National Lumber Manufacturers Association.

"If wood were a recent invention, it would be widely hailed for its value, for instance, as a modern all-purpose siding for houses," the Association points out. "We never hear many 'commercials' about it but yet, year in and year out, wood is not only the leading structural material for houses but it is also the top-ranking material for the finished exterior of American homes."

Home owners may get a fresh appreciation of the qualities of the wood siding that protects and dresses up their homes from a recent analysis made by the Forest Products Laboratory of the U. S. Department of Agriculture Forest Service.

This report says in part:

"Wood siding has long been a favorite material of Americans for finishing the exteriors of their homes. And for good reasons. It is economical to buy and put in place. It fends off the attacks of both hot and cold climates through the years with little or no perceptible wear. It comes in a variety of patterns and sizes to fit either traditional or modern styles of architecture. It has natural beauty and richness of color, or it can be painted any color that pleases the individual home owner. . .

"Another natural advantage of wood is its great stability with wide fluctuations in temperature and weather. Temperature changes that affect metals appreciably have no perceptible effect on the size of wood. Likewise wood siding, if properly installed, can withstand any range of moisture change from long-continued high humidity to prolonged summer drought without shrinking or swelling enough to destroy its serviceability. Unpainted wood wears away something like a quarter inch to the century. Kept painted, wood will last indefinitely as far as weathering is concerned. . .

"Its ability to hold paint well is another natural characteristic of wood that fits it for use as siding. Ordinary house paint can be applied at ordinary temperatures with a brush to give an attractive finish that will retain its beauty for years. . .

"A fourth property of wood essential to good service as siding is its ability to hold fastenings . . . the main consideration here is to use nails that are as proof against the weather as the wood is. . .

"Wood siding also contributes valuable insulation to a structure. . . wood siding helps keep interiors of homes cooler in summer and does not absorb and retain heat as do some other wall surfacing materials . . .

"Wood siding contributes to the rigidity and stability of the house. And it will withstand rather severe bumps and shocks without shattering."

Son of WSE Member Dies in the Himalayas

Arthur K. Gilkey, 26, a New York geologist and son of Dr. Henry J. Gilkey, MWSE, of Ames, Ia., died while trying with eight others to scale Mount Godwin Austen in the glacial wastes of the western Himalayas to the north of Pakistan.

Gilkey was killed when the roped-together party fell more than 100 feet over a sharp-edged ridge. They were about 25,000 feet up in the mountain. Reports say that Gilkey was lame and was being carried down the mountain on a stretcher at the time of the accident.

The last man on the rope saved others from being killed, by anchoring the line by throwing all his weight against a ledge. This allowed him to pull the others to safety.

Mount Godwin Austen, the highest unconquered peak in the world, is 28,250 feet high, only 752 feet less than Mount Everest, only recently conquered.

Plastic Engineers to Gather in Toronto

To exchange information on such chemical mysteries as "polystyrene/acrylonitrile co-polymers," 1,000 technical men will meet at the Royal York Hotel in Toronto next January 27, 28, 29 for the Tenth Annual Technical Conference of the Society of Plastics Engineers.

President Walter F. Oelman said that the delegates will represent the U. S., Canadian and foreign plastics industry. The theme of the conference is "Plastics International."

Conference sessions will open with a symposium on the developments and aplications of modified styrene from which many new products are manufactured.

A. Renfrew, director of the plastic division of Imperial Chemical Industries, England, will discuss world developments in plastics.

Technical talks will be heard on such topics as film and sheeting, properties of "Mylar" film, marking and decorating of plastics, plastics material problems in the power distribution field, automatic molding of thermosetting plastics and automatic thermoplastic molding with air operated presses. A demonstration will be given on reinforced plastics molding.

George M. Prall of Western Textile Products Co., St. Louis, Mo., will organize a forum on extrusion molding. Discussions will be held on polyethylene developments by a speaker from Bakelite Co. and vinyl plastisols and plastigels by a speaker from B. F. Goodrich Chemical Co. A feature of the meeting will be a highly technical research symposium conducted by Arthur J. Warner of the Federal Telecommunications Laboratories, Inc., Nutley, N. J.

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WSE Personals

Thomas G. Ayers, MWSE, has been elected vice president in charge of industrial relations of Commonwealth Edison company. The announcement was made by Willis Gale, chairman. Ayers succeeds Robert F. Creutz who resigned due to ill health.

In 1937 Ayers started with Public Service Company of Northern Illinois. He became an assistant vice president at the Edison company in April of last year.

In the August issue in this column we stated that **Henry L. Hoeppner,** MWSE, became chief engineer of Pioneer Service and Engineering Company, Chicago. He actually was promoted from senior electrical engineer of the company to chief electrical engineer of the company.

John Dragisic has been elected president of Asbestos & Magnesia Materials Co. P. D. Beaner was elected vice president; Walter L. Idenkirk, treasurer; and George M. Sundheim, secretary.

Kenneth Brunner has been named chief design engineer of Francis H. Bulot, Inc., consulting engineers, it was recently announced by **Francis H. Bulot,** MWSE, president.

Brunner, who joined the Bulot staff last January 1st, will make his headquarters in the firm's Pasadena office. He is a graduate of Northwestern University in Evanston, Ill., and was formerly an associate highway engineer for the State of California Division of highways.

J. Wesley Ooms, MWSE, wrote the Western Society recently from the Pine Bluff Arsenal in Arsenal, Ark. We quote here a couple of excerpts from the letter:

"The two years begun on 30 August 1951 are finally coming to an end, indicating that I may start civilian life with my mind at ease (I hope) in regards to further military service. Thus, I expect to take on a mate on Friday, September 11, and begin work in Minneapolis, Minnesota, two weeks or so later."

"Life in the Chemical Corps hasn't been too bad. I have had the opportunity of doing Safety work for the previous nineteen months, and find it quite interesting, particularly the statistical end of it. In my spare time I have continued my studies at the piano and am sending you a copy of a program that I will give next Sunday."

Ooms is now an inspector for the Fire Underwriters Inspection Bureau, 1229 Plymouth Building, Minneapolis, Minn.

Charles F. Marner, MWSE, an engineer with the Teletype Corp., has been a patient at Vaughan Hospital, Ward 81, Hines, Ill., we hear, since late February. We trust that he is now well on the way to a complete recovery.

William E. Mahin, former director of research at the Armour Research Foundation in Chicago, has been appointed technical director of the Vanadium Corporation of America at the firm's new research center in Cambridge, Ohio.

Frederick M. Poole, MWSE, wrote the Society an interesting letter from Agana, Guam, Marianas Islands. He is employed with the Public Works Department, Government of Guam. Here are several paragraphs from his letter:

"I have been residing in the Marianas Islands since July 1, 1951. From that date to Jan. 1, 1953 as Supt. of Public Works, Saipan District, and from Jan. 1, 1953 to May 1, 1953 as Construction Engineer, both with the Trust Territory of the Pacific Islands. Since May 1st I have been Resident Engineer, Govt. of Guam, on the construction of the new Guam Memorial Hospital.

"The Guam Memorial Hospital is a $7,500,000 permanent type tropical construction project being contracted as local funds are available. This 6-story multiple unit structure will serve the needs of the civilian population of Guam as well as the far flung Trust Territory comprising the former Japanese mandated islands. Completion is anticipated in late 1956.

"Guam is an island with a delightful tropical climate, quite in contrast to the rugged fluctuations of the Chicago area. However the heavy military expenditures with the accompanying influx of a large Stateside populace has produced a condition roughly comparable to our own west of the late 19th Century. Jerry-built structures, beer joints, and taxi-dance establishments are much in evidence. Modern concrete buildings, 4-lane pavements and innumerable taxis add the modern touch. With 25,000 natives to a total population of 75,000 a replica of Honolulu is in the making. This is truly a 20th Century American Frontier.

"We are looking forward to visiting the home area in the summer of 1954."

John G. Duba, MWSE, formerly an assistant professor of Civil Engineering at the Illinois Institute of Technology, has resigned to accept a position as an engineer in the Commissioner's Office, Department of Public Works, City of Chicago.

Dr. Gustav Egloff, MWSE, has been reappointed a member of the Inter-Society Relations Committee of the National Society of Engineers.

During the week of Aug. 23, Dr. Eg-

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loff made a tour of speeches in the state of Nebraska under the auspices of the Oil Industry Information Committee of the American Petroleum Institute, Missouri-Iowa District.

The Gerhardt F. Meyne Company's new address is 308 West Washington Street, Chicago 6.

Frank N. Barker, chief of the Illinois State Division of Highways, has resigned the position in order to become assistant chief engineer for the Santa Fe railway.

Archer L. Jackson, MWSE, president of A. L. Jackson Co., has been named chairman of the Public Relations Committee of the AGC Accident Prevention Committee.

Robert Talman, MWSE, who was sales and estimating engineer with the Oakley Steel Co. in Chicago is now assistant to the chief research and development engineer of Hannifin Corporation, 1101 South Kilbourn Ave., Chicago 24.

Westinghouse Photo

The wood piece being fitted into place by a craftsman forms one of the many ribs in this nearly completed pattern for part of a giant steam turbine that will help power a new atomic energy plant. When finished, the huge wooden form will be encased in sand to produce a mold. The casting made from this mold will form a section of a 200,000 kilowatt steam turbine generator unit—one of several such power giants ordered by the Ohio Valley Electric Corporation to supply the power needs of the new atomic energy plant near Portsmouth, Ohio.

Gerald J. Matchett Directs New Center

Dr. Gerald J. Matchett, associate professor in the department of business and economics at Illinois Institute of Technology, has been appointed director of the new National Center of Education and Research in Dynamic Equipment Policy which is being established this fall at I.I.T. in Chicago.

His appointment was announced by Dr. John T. Rettaliata, MWSE, president of the Institute.

As director of the newly-created center, Matchett will be responsible for organizing and developing its entire program of activity. Sponsored jointly by Illinois Tech and the Machinery and Allied Products Institute, the center will seek to help industry solve its problems and improve its practices in the field of capital equipment acquisition and replacement. The center will train specialists in this field and will conduct a program of continuous research to find improved techniques for industry.

An authority on engineering economics and capital equipment policy, Matchett has been on the faculty of the I.I.T. business and economics department since 1946. He introduced and developed a course in engineering economics which is now required in a number of the Institute's engineering curricula.

Matchett received his bachelor's degree, magna cum laude, from the University of Colorado. He earned his master's and doctorate degrees from Clark university. In addition to Illinois Tech, he has taught at Cornell university, Indiana university, Biarritz (France) American university, and Johns Hopkins university.

From 1942 to 1944 Matchett served as chief of the Review division of the War Labor Board's Denver regional office. In this position he was responsible for processing all wage stabilization cases in the Rocky Mountain region. He also has served with the Department of Agriculture as an economist, with the Department of Commerce as a business analyst, and as assistant editor of the *Survey of Current Business.*

The I.I.T. professor is co-author of the book, *Economics: Principles and Problems,* and has written numerous articles for business journals.

Solve a Problem of Ventilation

When a New York City firm contracted to deepen the basement of the Madison Avenue Presbyterian Church they were faced with two difficult problems:

(1) The sole opening into the basement was less than 3½ feet wide, greatly complicating the job of getting excavating equipment into the work area.

(2) Lack of ventilation would result in the accumulation of dangerous exhaust fumes from their gasoline-powered equipment.

The accessibility problem was ingeniously solved by dismantling a small tractor-shovel, moving it piece-by-piece into the basement, then reassembling it for the job. Use of the gasoline-powered tractor-shovel was cheaper than excavating with horses and drag scrapers and, of course, much less expensive than hand excavation.

The remaining problem—how to operate the gasoline-powered equipment safely despite poor ventilation in the confined area—was effectively solved by fitting the tractor engine with an OCM Catalytic Exhaust System. This device was substituted for the regular muffler. It oxidizes poisonous carbon monoxide and hydrocarbon vapors, exhausting a harmless effluent to the working atmosphere.

The job was to dig some 2,000 cubic yards of rubble and dirt from two basement areas—one 65 x 90 feet and the other 22 x 100 feet—located ten feet below street level. The only access to the work site was an opening three feet five inches wide and six feet high.

The tractor-loader operated two shifts to average 75-place yards daily. Ordinarily, continuous indoor operation of gasoline-powered equipment for such long periods could be expected to produce a dangerous concentration of carbon monoxide and other noxious gases. The catalytic exhaust system eliminated these fumes, and the tractor was operated with complete safety and with a total absence of nausea, headaches or other ill effects.

The successful use of this equipment is a significant development in the construction industry. Gasoline-powered construction equipment—once limited to outdoor jobs—can now be easily and economically converted for safe operation indoors and in such places as mines and tunnels.

Heart of the catalytic exhaust system is a cartridge of spaced porcelain rods coated with a catalytic agent—catalytic alumina and platinum alloy. The engine exhaust flows across the surface of these rods where combustion of the carbon monoxide and other harmful vapors takes place. On leaving the catalyst the exhaust contains mostly carbon dioxide and water vapor, and only slight traces of the original contaminants.

Yards-Docks Bureau Sponsors Symposium

The Bureau of Yards and Docks of the Department of the Navy is sponsoring an Advanced Base Water Supply and Sanitation Symposium which is being held on Oct. 7, 8 and 9 at the U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, California. The purpose of the Symposium is to bring together military personnel, scientists, and practicing engineers to explore and discuss the requirements, problems, and current and future developments of water supply and how it is affected by related field sanitation. All discussions will be directed toward the development of new equipment and practices that might assure a safe water supply and simplify logistics and field operations for military personnel in forward areas.

Representatives from various military services, government and private research centers, universities, public works departments, and equipment manufacturers were invited to present appropriate papers at the Symposium. Some of the nation's outstanding scientists and engineers have accepted.

General topics scheduled for discussion include: The Military Problem, Desalting of Sea Water, Water Purification, Sanitation, Polar and Arid Water Supply, and Future Trends and Possibilities. In planning the discussion emphasis was placed on theories, special requirements, and unique solutions that are adaptable to military operations.

ASCE Members to Present Papers

Some 150 technical papers, covering thirteen general areas of engineering activity, research and development, will be presented by outstanding members of the profession at the annual meeting, Oct. 19-23, in the Statler Hotel, New York, of the American Society of Civil Engineers. Mass transportation will be the emphasized theme, with five sessions devoted to that subject.

Bertram D. Tallamy, chairman of the New York State Thruway Authority, will be the principal speaker at a luncheon, Oct. 19, of the Society's Highway Division.

Col. William N. Carey, executive secretary, said that the Society, which is the oldest national professional engineering organization in the United States, is preparing for an attendance of 3,000. Included will be many of the world's most eminent engineers. Members and guests will come from many countries. The Society, founded in New York City in 1852, celebrated its centennial last year with a convocation of engineers of all branches of the profession.

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Graduates Doing Fine

How is the college graduate of five years ago doing today?

To find out, Illinois Institute of Technology surveyed its class of 1948 and came up with some interesting statistics.

Financially, the '48 graduate is doing very well. In fact, he has bettered himself just about 100 per cent in five years time. He started work after graduation at an annual salary of $3,180, and today he is earning $6,340.

Over-all, 96 per cent of the '48 class earn more than $4,500 annually; 76 per cent earn more than $5,500; 46 per cent make more than $6,500; and 17 per cent are in the over-$7,500 bracket.

Present age of the I. I. T. class studied ranges from 24 to 40 years, with 29 being the average age. There was no discernible correlation between salary and age.

The survey did show, however, a definite relationship between salary and family status. Those graduates who had the greater number of dependents also had the larger salaries.

The '48 graduates also were asked, "Would you return to I. I. T. if you had to do it over again?" Seventy-two per cent said "yes."

Summing up, the average 1948 graduate of Illinois Tech looks something like this: he is 29 years old, married, has one or two children, earns $6,340 a year, and would return to I. I. T. if he had to do it over again.

Technical Commission to Hold Fall Meeting

The Radio Technical Commission for Marine Services is holding its fall assembly meeting on Oct. 19, 20 and 21 at the Edgewater Beach Hotel in Chicago.

The Commission was organized in 1947 as a cooperative body to hold a meeting of both government and non-government agencies with marine interests. The Commission's purpose is to consider existing and proposed systems of marine communications and navigational aids. Also to foster developments to meet operating requirements.

Technical sessions will be divided into three half-day symposia. The first will be of particular interest to industries with operations on the lakes and rivers. This symposium will picture how each of the predominant marine industries uses the various marine radio and electronic devices.

The second symposium will consider the progress made in the use of new electronic equipment such as radar and VHF antennas.

In the third symposium a panel of top maritime experts will discuss "Regulation in the Public Interest."

A field trip, ladies' program dinner, luncheons and a social hour will be included in the three-day meeting.

Members of the Western Society have been especially invited to attend all of the activities.

Further information may be had from K. V. Glentzer, MWSE, chairman of the local arrangements committee. Contact him at the Illinois Bell Telephone Co., 208 W. Washington st., Chicago. His telephone number is OFficial 3-9300, Extension 3333.

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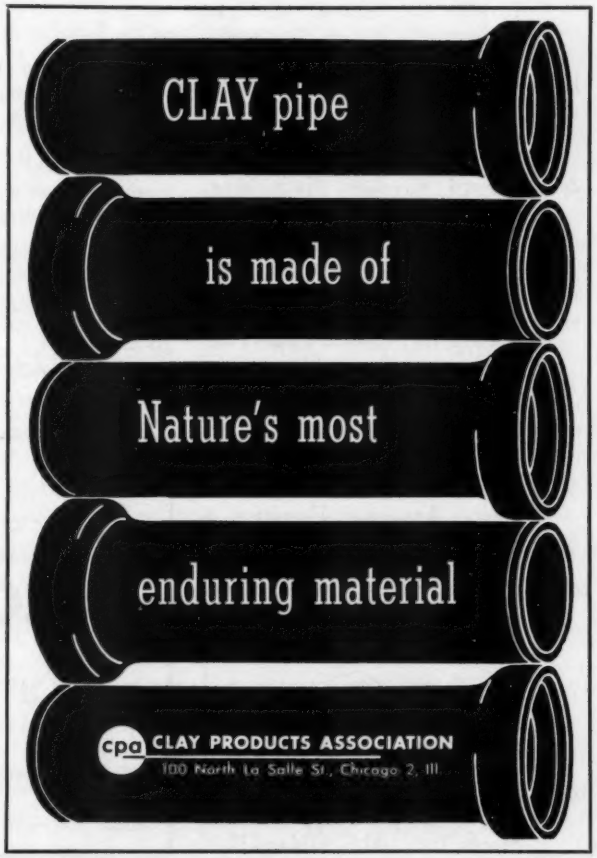

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

8-53 William T. Bowler, Jr., Chief Engineer, Forest Paving and Equipment Co., 5310 W. Ainslie St.

9-53 Carl H. Bauer, Manager Construction & Equipment Dept., Butler Brothers, 430 W. Randolph St.

10-53 Walter F. Senkus, Regional Sales Representative, DeLaval Steam Turbine Co., 122 S. Michigan Avenue.

11-53 Joseph C. Braet, Engineer, Economy Plumbing & Heating Co., 1308 S. Pulaski Rd.

12-53 Edward W. Ross, Secretary, Economy Plumbing & Heating Co., 1308 S. Pulaski Rd.

13-53 Howard R. Ross, Secretary (Exec.), Economy Plumbing & Heating Co., 1308 S. Pulaski Rd.

14-53 Robert E. Zelin, Engineer, Economy Plumbing & Heating Co., 1308 S. Pulaski Rd.

15-53 Arthur E. Wychocki, Field Engineer, Economy Plumbing & Heating Co., 1308 S. Pulaski Rd.

16-53 Irvin E. Biales, Owner, Continental Wire & Iron Works, 1248 S. Ashland Av.

17-53 Thomas Morrison, Assistant to the President, DeLeuw, Cather & Co., 150 N. Wacker Dr.

18-53 Mrs. Martha W. Nydam, Manager Store Planning, Wieboldt Stores, Inc., 106 S. Ashland Blvd.

19-53 C. L. Conrad, District Manager, Diamond Power Spec. Corp., 105 W. Adams St.

20-53 Richard J. Artwohl, Field Engineer, Grade III, DeLeuw, Cather & Co., 150 N. Wacker Dr.

21-53 Bernard A. Carrol, Quality Control Manager, Automatic Electric Co., 1033 W. Van Buren St.

22-53 Arthur C. Rehm, President, States Improvement Co., 30 N. LaSalle St.

23-53 Nicholas A. Levchuk, Civil Engineer, State of Illinois, 160 N. LaSalle St.

24-53 Arvid B. Newhouse, Engineer, Automatic Electric Co., 1033 W. Van Buren St.

25-53 Miss Renee W. Danforth, Designer, Elgin National Watch Co., Elgin, Ill.

26-53 Robert P. Link, Associate Prof., University of Illinois, Urbana, Ill.

Building's Top Floors to Use Electric Stairs

The Prudential Insurance Company of America building under construction just west of WSE Headquarters in Chicago will be the first skyscraper in the world to have electric stairways serving its top floors.

This was revealed with the awarding of a contract to Westinghouse Electric Corporation Sept. 4 for 12 electric stairways in the new structure.

Four of the stairways will provide transportation from the building's fortieth floor to the observation deck two stories higher. Their use will eliminate the need for an elevator penthouse on the roof.

One stairway will be installed from the Illinois Central Railroad Company platform to the ground floor, another from the ground floor to the lobby or first floor, and six will serve from the first to the fourth floor, a part of the Prudential Company's area.

The 32-inch wide stairways will travel 120-feet per minute. They will be able to transfer more than 6,000 people per hour from one floor to another.

The contract for the electric stairway installation is one of the largest single contracts of its kind ever awarded.

The Prudential building, which is being built over the Illinois Central Railroad tracks on Michigan Boulevard, will be the Mid-America headquarters of the insurance company. It will be completed in 1955. The firm of Naess and Murphy are the architects and engineers.

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Find Hydrogen Fluoride a Solvent

The discovery that a large number of compounds of biological interest can be dissolved in liquid hydrogen fluoride was announced Sept. 9 at the 124th national meeting of the American Chemical Society by Dr. Joseph J. Katz, a Senior Chemist at Argonne National Laboratory.

Hydrogen fluoride, a powerful chemical reagent which readily dissolves glass and is used in the manufacture of aviation gasoline, has hitherto received little attention as a solvent for compounds of interest in biology and medicine. As a result of the study at Argonne, it is now known that a large number of compounds including amino acids, proteins, insulin, ACTH, and vitamin B_{12} can be dissolved in the liquid and, in many cases, recovered with little or no loss of biological activity. Dr. Katz reported that material which will dissolve in water will dissolve more quickly in hydrogen fluoride, and that many water-insoluble materials are readily dissolved in hydrogen fluoride.

The experiments were carried out in small transparent tubes made of Fluorothene or Kel-F, fluorine-containing plastics. The traditional difficulties of making visual observations in hydrogen fluoride were, to a very large extent, overcome by the use of the new plastic.

Among the enzymes found to be soluble are lysozyme (from egg white), cytochrome C (a respiratory ferment), trypsin, and ribonuclease (important in nucleic acid metabolism). Among the many soluble proteins were egg albumin, casein, zein, peanut protein, and hide collagen. The hormones insulin and ACTH were also exceedingly soluble.

While many proteins are recovered in a water-insoluble condition, the enzymes and hormones mentioned above are recovered in a water-soluble state. The insulin and ACTH recovered from hydrogen fluoride solution are found to still retain their biological potency.

Proteins can be readily recovered from solution in the form of films and fibers. This suggests the possibility of using the unusual solvent, hydrogen fluoride, as a means for the preparation of fibers and film from vegetable and animal proteins.

Other biologically important materials which can be dissolved in hydrogen fluoride are chlorophyll, which can be readily extracted from grass or algae, and vitamin B_{12}, the anti-pernicious anemia factor.

Numerous unusual chemical reagents can be dissolved in hydrogen fluoride, which suggests the possibility of using this medium for the preparation of chemically-altered proteins.

While it is obviously premature to draw any far-reaching conclusions from the study, it must be noted that a new method for studying biological and medical materials has now been developed.

Construction Method Eliminates Mortar Use

A new method for building construction eliminates the use of mortar and effects savings in time, material and labor by using concrete shot from an air placement machine to tie dry building blocks together, Construction Methods and Equipment, McGraw-Hill publication, reports.

A Kansas City, Mo., company has just completed successful experimentation with the new method in the erection of a two-story building, according to the magazine.

In construction, the lightweight dry concrete blocks were stacked on a level foundation to about standard window height. Then the concrete was blown on the interior surface. Tests showed that the coating added sufficient strength to continue the wall in the same manner. Later, an exterior coat of gunned concrete was applied.

Air-placed concrete also was used to anchor standard reinforcement and support materials, to seal gaps between frames and walls, build up sills and make joints watertight, the magazine says.

Many construction methods of applying gunned concrete were tried in the experimental building. Therefore, it was impossible to arrive at conclusive cost figures, but results showed that worthwhile savings can accompany this type of construction.

Noise Abatement Subject of Meeting

The speakers and program have been announced in Chicago for the fourth annual National Noise Abatement Symposium to be held October 23 and 24 at Armour Research Foundation of Illinois Institute of Technology.

The symposium, designed to give a comprehensive picture of nation-wide activities in the field of noise, will feature talks by leading authorities on outdoor noise problems. One session will be devoted to the industrial noise hazard.

George L. Bonvallet, program committee chairman, said more than 300 scientists, engineers, doctors, architects, manufacturers, and civic authorities are expected to attend the national meeting.

Although the three previous meetings were one-day affairs, this year's symposium has a broader scope and will extend over a two-day period. Eleven speakers will fill out the agenda for the two morning and one afternoon sessions.

Sponsors of the meeting are: National Noise Abatement Council, Acoustical Materials Association, American Society of Safety Engineers, Acoustical Society of America, American Industrial Hygiene Association, American Society of Planning Officials, Council on Industrial Health, American Medical Association; American Institute of Architects, and Armour Research Foundation.

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Local College to Meet on "Ways of Science"

Roosevelt College in Chicago will hold its fourth annual Ways of Science Conference Saturday, October 17, at which noted scientists and philosophers will examine methods by which subjects for study and research are determined.

The practical and theoretical approaches to this question will be presented by two noted scientists, Dr. Richard McKeon, distinguished service professor of philosophy and Greek at the University of Chicago, and Dr. Hardon A. Leedy, vice-president and director of the Armour Research Foundation at the Illinois Institute of Technology in Chicago.

Dr. McKeon, who will discuss the theoretical approach, is renowned as a scholar and philosopher. In 1934 he came to the University of Chicago as a visiting professor and the following year was appointed to head the division of humanities, a post which he held for 12 years.

Author of *The Basic Works of Aristotle*, Dr. McKeon received his bachelor's and master's degrees in the same year from Columbia University, and after graduate study in Paris, joined the Columbia faculty, where he later received his Ph.D. degree.

The practical approach will be analyzed by the well known physicist Dr. Leedy, who served for three years on the Chicago Board of Health committee on Biological Warfare, and as physicist and chairman of Physics Research at the Armour Research Foundation. He was formerly an assistant in Physics at the University of Illinois.

Obituaries

The body of **Fred T. Whiting,** who served on the Western Society's Finance Committee, on the Washington Award Commission and was a trustee on the Board of Direction from 1948 to 1951, was returned to Chicago late in August for burial.

Mr. Whiting, 62, a vice president of the Westinghouse Electric Corporation,

Fred T. Whiting, MWSE

drowned in Morice River in northern British Columbia on August 20 while he was on a fishing trip.

Other members of the fishing party had reported him missing to the Royal Canadian mounted police, who recovered his body from the ice-cold river.

Mr. Whiting flew into the primitive fishing area with others in a private plane. He stayed at a base camp and was missing when the other members of the party returned. It is not known what actually happened. He may have suffered a heart attack, or accidentally slipped into the frigid water.

William S. Monroe, an honorary member and former president of the Western Society, died on September 14, 1953.

Mr. Monroe was a member of the board of trustees of the Illinois Institute of Technology. He was president of Sargent and Lundy from 1919 until his retirement in 1938.

The Western Society has just learned of the death of **George W. Seth** who died on February 12, 1953.

Mr. Seth had been a structural engineer with the firm of Holabird, Root and Burgee. He had joined the Western Society in 1928.

E. C. DeWolfe, a life member of the Western Society since 1934 and a member since 1903, died on July 5, 1953, the Society has just learned.

Mr. DeWolfe had been the proprietor of the DeWolfe Advertising Service in River Grove, Illinois. He had at one time been an associate editor of *Steam Engineering.*

He was especially interested in Mechanical and Electrical Engineering.

Fred A. Poor, board chairman of Poor and Company, railway equipment manufacturers, died on August 25, 1953.

He had dined at the Saddle and Cycle Club in Chicago with his wife. He complained of feeling unwell and collapsed as his wife led him outside.

Mr. Poor joined the Western Society in 1919. He had been a life member since 1949.

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Reviews of Technical Books

Electricity

Elements of Electricity, by William H. Timbie, John Wiley & Sons, Inc., New York, New York. Fourth Edition, 1953. 631 pages. $5.50.

In this edition, the fourth, the author has retained the idea of an elementary textbook in the basic principles of electrical engineering. The content of the book has been revised in keeping with progress in the field of electrical engineering.

The author points out in the Preface that he has taken cognizance of this in discussions of aluminum wire, ceramic capacitators, transitors, radar, television, dry and gaseous rectifiers, etc.

Ohm's law is considered in the opening chapter leading to a discussion of power and energy. This is followed by the consideration of resistance and current-carrying capacity of wire and the measurement of resistance.

Material on magnets and magnetism and consideration of the magnetic circuit are included before generators and motors are discussed.

After batteries are discussed a chapter on simplification of circuits is presented where Kirchhoff's laws and Thevenin's theorem are presented.

Inductance and capacitance are then treated prior to the elementary theory of alternating currents. Finally material on electronics and electron tubes is given.

The book has a number of examples and problems which illustrates the theory very well, and should leave a minimum of explaining to be done by the teacher.

This book is recommended for a first course in the subject.

R.G.O., W.S.E.

Power Plants

Power Plant Engineering, by Frederick T. Morse, D. Van Nostrand Company, Inc., New York, N. Y. Third Edition, 1953. 687 pages. $5.00.

This book is a revision of Professor Morse's Power Plant Engineering and Design which was originally published in 1932. The difference in content and presentation of material in his new edition could be cause to consider this more than a revision, possibly a new book.

The introductory chapter considers energy and power and background material of power study. The variable load problem, power plant economics and the power plant building are then considered in order.

A chapter is included on combustion before considering the internal combustion engine power plant and the gas turbine power plant which is an added chapter to this revision.

Chapters eight through thirteen deal with steam power plants. These six chapters, together with chapters one and five, represent a thorough study of steam power plants, and as the author points out in the Preface could be considered as subject matter for a one semester course in this subject.

A number of examples throughout the book, together with problems at the end of the chapters, serve to increase the value of the book as a college text. Practicing engineers interested in the power field should find this book a valuable addition to their library.

R.G.O., W.S.E.

Engineering Economy

Introduction to Engineering Economy, by Baldwin M. Woods and E. Paul DeGarmo, The Macmillan Company, New York, New York. Second Edition, 1953. 519 pages. $6.00.

This edition maintains the high quality of analysis that marked the first edition appearing eleven years ago and thus will continue to serve as an admirable text to introduce the student to Engineering Economics.

In the years that have elapsed since the appearance of the first edition, significant changes have occurred in the field of Engineering Economics. Most college engineering curricula have introduced required courses in the subject, more industries are requiring extensive economy studies before making decisions regarding new capital expenditures or replacement expenditures, and higher tax rates and inflation have complicated economy studies enormously.

The authors of this revision are aware of these changes. While the basic outline of the book remains the same, a successful attempt has been made to improve the clarity of presentation and the stimulation of interest.

Furthermore, the chapter on fundamental investment studies has been expanded to include a section on income tax effects and the chapter dealing with government projects has been extensively revised.

G.J.M.

Mechanics of Fluids

Basic Mechanics of Fluids, by Hunter Rouse and J. W. Howe, John Wiley & Sons, Inc., New York, New York. First Edition, 1953. 245 pages. $4.50.

This text closely follows the form of an earlier text by Hunter Rouse, *Elementary Mechanics of Fluids*, but has been completely rewritten so that it may be within the grasp of the average junior student. It presents the whole field of fluid mechanics in an integrated manner, as a continuation of the other mechanics courses required in an engineering curriculum.

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C-1274(a) SENIOR PHYSICIST—MS or PhD. Physics. 5 plus yrs. exp. in fields of measurement of temperature, pressure, flow and/or viscosity. Knowledge of industrial or process controls. Duties: development and research work on controls and instrumentation for industrial and process plants. For a manufacturer of appliances. Sal: $486-646. Location: Minnesota.

C-1274(b) DEVELOPMENT ENGINEER—EE 6 plus yrs. exp. in design, development, and pilot production of electrical, electronic or electro-mechanical devices. Duties: development of controls and instrumentation devices for appliances, industrial and process plants. For a manufacturer of appl. Salary: $456-646. Loc: Minnesota.

C-1274(c) DEVELOPMENT — ME or EE 4 plus yrs. in design or development of special packaging for electronic equipment. Duties: supervise packaging problems, covering heat transfer, vibration isolation, shock resistance, miniaturization, hermetic sealing and cooling. For mfgr. of appliances. Sal: $486 to 646 mo. Loc: Minnesota.

C-1274(f) DESIGNER—ME 2 plus yrs. in machine design of special ultra fine grinding machinery. Knowl: of hydraulics and basic electricity. Duties: design special fine grinding machinery. Also similar men to work on mechanical computors and precision instruments. Sal: $392-646 mo. dep. on exp. For manufacturer of appliances. Location: Minnesota.

C-1274(g) RECENT GRAD. — Field work. EE or ME Technical knowledge of, or interest in military sonar, radar, loran, etc. desirable. Field work training operators of above type equipment, supervise installations, and generally represent manufacturer of appliances. Sal: $326-440 per mo. plus liberal expenses. Some Traveling. Loc: Minn. Headquarters.

C-1275 ASSOC. PROF.—Ph. D. EE. Age: 35-40, 4 plus yrs. previous teaching exp. Knowl: electronics or communications. May take power knowledge. Duties: teaching graduate work in electronics, communications or power. May also be some research work. Sal: $7,000-8000. 12 months. Loc: Fla.

C-1276 FIELD ENGR. — Civil Engr. Age: 22-30. Recent grad. or better—Preferably exp. on board detailing structural steel. Knowledge of structural steel. Duties: field survey and assist superintendent in erections of structural steel bridges and building. For a manufacturer of structural steel. Sal: $375-500 per month. Travel from job to job. Location: U.S.A.

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710 MW CHIEF ENGR. 45 Nine mos. consultant on tooling & machining methods. Many yrs. supervision of design & building of jigs, fixtures, dies, molds, & special machinery. $10,000 Midwest

711 MW WELDING ENGR. ME 28 Three yrs. establish welding procedures for manual & automatic submerged arc production welding, estimating of material & labor cost for incoming work, selection & purchasing of equip. $6800 Midwest.

713 MW PLANT ENGR. ME 35 One yr. design of heating, piping, plumbing, ventilation & air conditioning systems. Five yrs. estimating contract costs & supervising installation. Two yrs. Ass't. resident engr. resp. for mech. equipment erection. Six yrs. as operating engineer. $7500 South & West.

714 MW FIELD ENGR. Gen. Eng. 49 Twenty-seven yrs. exp. in construction of projects, bridges, sewage plants, water works & industrial bldgs. Also supervised the estimating & acted as operating head of the company. $10,000 Chicago.

715 MW CONSTR. SUPT. CE 55 Better than ten yrs. supervising general construction work. $8500. U. S.

716 MW SOIL MECHANICS ENGR. MSIE 29 Three yrs. evaluate effectiveness of foundation courses & foundation designs for concrete highways. Two yrs. responsible for constr. & maint. of highways. $6000 Midwest.

717 MW CONSTR. SUPT. CE 29 Twenty-eight mos. Seismograph surveyor. Twenty-one mos. supervise construction of highway projects. $5000 Chicago.

Method of Analysis of Water Announced

Formulation of a scheme for the analysis of industrial water was announced in Chicago Sept. 8 to chemists attending the semi-annual meeting of the American Chemical Society. The scheme was described in a paper co-authored by J. H. Phillips, chief chemist and K. G. Stoffer, senior chemist at the Research Center of The Babcock & Wilcox Company in Alliance, Ohio and presented by Phillips.

Phillips pointed out that from beginning to end, the substances contained in water must be controlled for industrial and community usage. Natural water must be treated with chemicals to remove those undesirable constituents that would interfere with the operation of industrial equipment. It must be treated to remove any constituents that would interfere with the chemical reactions involved in industrial processes. Waste water from many processes must be treated to avoid harmful pollution of streams as governed by city, state, and federal regulations.

As a result, the American Society for Testing Materials, through its committee on industrial water, appointed a task group consisting of a cross-section of chemists in industry and government agencies, with Mr. Phillips as chairman, to set up a scheme for the analysis of industrial water. The findings were presented at the meeting as a part of a symposium sponsored jointly by the A.S.T.M., the Joint Research Committee on Boiler Feedwater Studies and the A.C.S.

The scheme includes a comprehensive list of the properties and constituents in industrial water for which analyses are made and the order of application of the many methods for chemical and physical measurements. The problem was complex and required several attempts before a manageable outline form for easy reference was devised.

The scheme will have numerous advantages in industry, Phillips said, in that it will provide a basis for further studies involving water analysis. It will also give governmental agencies and industry a common ground for studying water quality in streams and other water supplies, he said.

16th Fuels Conference to Be Held In Chicago

The American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers will hold their annual Joint Fuels Conference in the Grand Ball Room of the Conrad Hilton hotel in Chicago, Oct. 29-30.

The program, which is already printed, covers major developments in the fuels field and will summarize the midwest oil, gas and solid fuels situation in a comprehensive way.

The importance of the subjects presented and the caliber of the authors of the papers ensures a conference that will be of outstanding interest to engineers and executives of enterprises interested in fuel production and utilization.

Early registration is urged.

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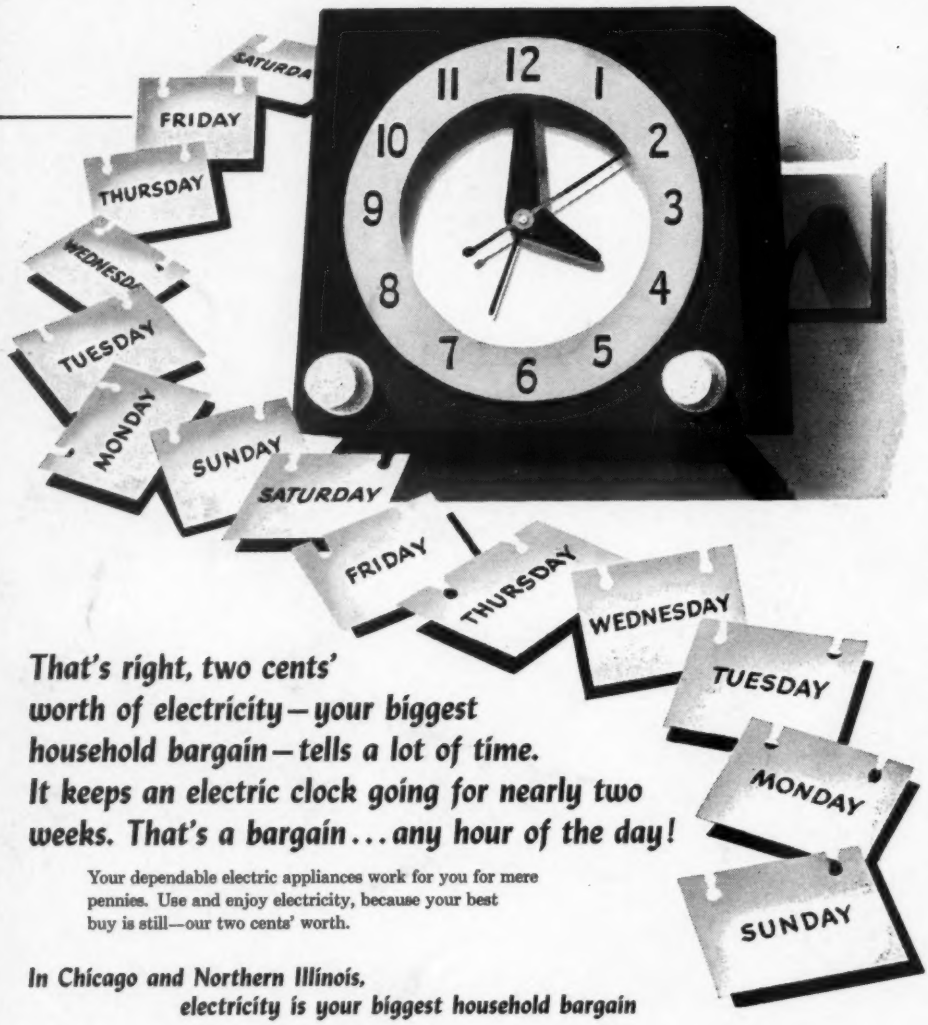

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